# STRUCTURAL ADJUSTMENT AND REGIONAL RELOCATION IN THE TASMANIAN HOP INDUSTRY

by

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Except as stated herein, this thesis contains no material which has been accepted for the award of any other degree or diploma in any university. To the best of my knowledge and belief this thesis contains no copy or paraphrase of material previously published or written by another person, except where due reference is made in the text.

Signed .....

C.L.MILLER

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## ABSTRACT

The uniqueness of the agricultural pursuit of hop growing lies in its very high input costs and related agglomerative tendencies; the interest for this study lies in the predictable fluctuations in the area planted to the crop, deriving as they do from a complex of market-related and industry-behaviour considerations.

Physical requirements for the crop are relatively narrow, but more important causes of local specialization have traditionally derived from the industrial use of the crop and the centralizing of certain processing facilities, particularly as these affect smaller producers. The attraction of the perennial crop for producers of even a hectare or less derives from the prospect of highly profitable returns; a prospect frequently not fulfilled. The hop plant, *Humulus lupulus*, has earned its reputation as a gambler's crop; the balance between fixed input costs, variable yields and prices for the commodity periodically has favoured costs over returns, leading to cyclical changes in total planted area and in the number of hop growers. The spatial expression of such fluctuations is seen in the emergence of a core area of production within which land-use intensity for the crop has remained relatively unchanged for over a century. Beyond the core, the extensive margins of production exhibit cyclical expansion and contraction, at times including localities as widely spaced as Flinders Island and Strahan; but the forces leading to concentration and specialization within the industry have tended to confine production increasingly to the Derwent Valley and minor localities in the south of the state until the last two decades. Since 1960, a major new production region has emerged in

the north-east of the state, reflecting changed economies of scale brought about by improved hop varieties and technological developments. The new hops have higher brewing value, thereby reducing the relative demand from brewers; smaller, more traditional growers in the south of the state have not been able to compete with the lower unit production costs of larger growers and have ceased production almost entirely. The central argument of the thesis is that the industry approach, particularly involving detailed study of production on individual farms, is a valuable contribution towards the understanding of patterns of agricultural land use as a whole. The study examines the industry in its historical and contemporary contexts and demonstrates the interrelatedness of physical and economic constraints to production. It considers the nature of political and behavioural influences and their respective impact on the spatial arrangement of the industry.

## PREFACE

Hops have always been the most important industrial crop in Tasmania in cash income terms.* The number of growers involved in this highly localized agricultural pursuit has never exceeded 200 but the number of people partly or wholly dependent on hops for their livelihood has been substantial. Whole communities in the Derwent Valley owe their origin and character to this crop despite the fact that it occupies less than 1% of the area of land used for principal crops in the state (A.B.S., 1976a).

This study of the Tasmanian hop industry examines both the history of changing internal and external economic processes and patterns of spatial distribution of the crop enterprise, and the present structure and regional distribution of the industry. The small scale of the study enables the compilation of detailed information on the entire population of hop producers in 1978 from field surveys and interviews with hop growers and others associated with the industry. As well, considerable data pertinent to earlier periods within the industry have been obtained from both primary and secondary sources.

### The structure of the thesis

The geographical analysis of the Tasmanian hop industry requires a relatively detailed understanding of the specialized nature of the crop enterprise and some awareness of the particular physical, political, social and economic influences which have variously contributed to the emergence of the present spatial pattern of production.

* Since about 1974, income from oil poppies for codeine manufacture may have exceeded hop income, but data are not available on oil poppy production.

The introductory chapter of this thesis will therefore be devoted to an outline of the technology of hop production in Tasmania and essential aspects of production costs and returns to farmers. In addition, consideration will be given to the lack of viable alternatives to hop production for hop producers in times of market over-supply, and to the characteristic spatial patterns of expansion and contraction within the industry resulting from its very specific market.

Chapter I of the thesis will present a rationale for the study of Tasmania's hop industry and an outline of methodological considerations pertinent to the study. Included here will be a more detailed examination of physical and economic considerations pertinent to the spatial aspects of Tasmania's hop industry and a description of the survey method and data. This chapter will conclude with the presentation of three specific themes which are central to the arguments developed within the thesis.

The economic structure and spatial arrangement of the hop industry in Tasmania in 1978 can only be fully explained by reference to historical circumstances. The first of the three main expository chapters in the thesis, Chapter II, is therefore a historical analysis from the foundations of the industry to 1960 which is loosely defined as the beginning of the contemporary period. Three subsections of this chapter trace the major cycles of expansion and contraction within the industry and their associated spatial impact.

Chapter III examines two related cross-currents which began around 1960 and continue to have direct spatial impact in 1978; the establishment of a completely new hop producing region in the state,

and a set of economic and structural changes beginning with technological advances and culminating in a transformation of virtually the entire industry. The net result of the two cross-currents has been a contraction of planted area and a near-total elimination of small producers in the south of the state within the last five years. It is on this period that the third section of Chapter III concentrates.

Chapter IV attempts a micro-regional analysis of farm operations, natural environment and related variables, as well as considering the wider questions of the impact of particular marketing arrangements and behavioural responses of farmers within the context of the post-1960 period.

Chapter V, the conclusion, attempts to draw together the major themes from both the historical and contemporary periods, and develops for this purpose an explanatory model (Fig. V.1). Conclusions pertaining to the main themes of the study are also drawn, and recommendations for further geographic studies of a crop-specific nature are made.

# I N T R O D U C T I O N

## Preamble

Commercial production of hops is a specialized activity which will be described in some detail in the ensuing sections in order that the main task of historical and contemporary analysis of the industry in its spatial context within Tasmania may be facilitated. The hop plant has particular requirements for optimum commercial success and these will be indicated before proceeding to a description of the technology of the industry; the latter, of course, must be understood before any consideration of the locational aspects of the industry can be undertaken.

The technology of the hop industry relates partly to the physical requirements of the crop and partly reflects the economic context within which the industry operates. Description and analysis of the Tasmanian hop industry in economic terms, with particular reference to the variations in farm 'size' (size of hopground per farm) and management will be undertaken in subsequent sections with a broad division between costs of establishment or expansion of existing farms on the one hand and costs of production and returns to farmers on the other. These sections will be followed by related sections on marketing and on the spatial context within which the industry analysis occurs.

## The hop plant - requirements for commercial production

Hop production involves the cultivation of a climbing perennial, *Humulus lupulus*, of the family *Cannabinaceae*. The plant is dioecious, having male and female inflorescence on separate plants, the female flower cone being used for the one

major economic purpose for which the plant is cultivated - the brewing of beer. In recent years, selective breeding of the plant has reduced the former wide variety of plant types employed commercially for their aroma or brewing properties to only one variety, the Pride of Ringwood. The brewing value of this variety as measured by the percentage of alpha acids or essential hop lupulin present in the cones has doubled the brewing value of earlier varieties.

Growth of the flower cones is most successfully induced between certain latitudes on the earth's surface, namely about 37 to 54 degrees, due to the photoperiodism of these latitudes. In lower latitudes, increased photosynthesis tends to lead to vigorous plants with fewer flowers; in higher latitudes total plant and flower growth is inadequate due to lower temperatures and/or the shorter growing season. Tasmania lies between 40 degrees and 45 degrees south latitude.

Hop plants are heavy feeders; they have long roots which require deep, friable, moisture-holding soils that are not subject to water-logging. In Tasmania, these characteristics occur in many localities. However, there developed in the state a typical association of hop production with river alluvium in the valleys of the River Derwent and its tributaries in the nineteenth century due to the need to obtain gravity-fed irrigation water which naturally was more readily available on the low-lying river flats. Technological improvements in irrigation removed the need for this association before the end of the nineteenth century but it persisted until the early 1960's with only a scattering of very small hop holdings on non-valley-floor sites. By contrast, hops have more usually been grown on hill-

sides in Kent and in Germany in order to avoid frosts, and in recent decades hillsides have been successfully used for sizable holdings in Tasmania.

Other physical requirements for commercial production include the need to avoid frost-prone localities and to either avoid exposure to winds or to provide wind breaks for this purpose. Water availability for summer irrigation is also a consideration.

Due to the need for fairly constant individual attention to hop plants, production of the crop is a relatively specialized activity although some diversification on a proportion of hop farms has always existed in Tasmania. In common with many other crop enterprises however, the trend in recent years has been towards increased specialization both on individual farms and in terms of particular localities which appear to be most suited to production of the crop.

In this study it will be evident that total farm area is not particularly important as many hop farms have large areas of forested hillsides suited only to rough grazing or indeed quite unsuited to any economic activity. Farms producing hops will be referred to as 'small' (up to 4 hectares), 'medium' (over 4 hectares and up to 12 hectares) and 'large' (over 12 hectares) in terms of their hopground area rather than their total farm area except where it is expressly stated that total farm area is under consideration. The term 'hopground' refers to the actual area planted to hops and includes the straining poles, support poles and overhead trellis system upon which the hops climb. Hopgrounds are sometimes referred to as hopfields in Tasmania, but rarely are they termed hop gardens as is the case in Kent.

The technology of hop cultivation in Tasmania

In Tasmania hops have been cultivated using a variety of climbing systems such as one pole per plant, and vertical trellises, but for over half a century the preferred system has involved a horizontal overhead wire trellis supported by uniformly spaced 'hop poles' of some 5.5m above ground level, and usually sunk into the ground to a depth of about one metre. The plants are trained to send their vines up three or four plastic strings, one vine per string, the lower end of the string being sunk into the ground around the hop plant roots or hop 'hill', the upper end being tied to the trellis some 5.5m overhead. Pole spacings vary from one hopground to another but in a fairly typical arrangement plants would be spaced 2m x 2m with every second row being a pole row and poles spaced about 6m within this row. Variability of plant spacing has certain effects on yields due to different numbers of plants per hectare and different degrees of exposure to direct sunlight; farms are therefore not always strictly comparable in terms of yield; a standard measure of hopground known as a 'hop acre' consists of 1,200 hills of hops regardless of ground area occupied by the plants, and on this basis yield comparisons are generally made within the industry. A 'hop hectare' therefore consists of 2,965 hills of hops.

The hop plant sends out numerous vines from ground level in the spring. Three or four of the most suitable ones - not necessarily the strongest - are selected and trained individually up the plastic twine or strings already in place. At harvest, formerly the string was cut near ground level and the vine pulled downwards and hand-picked into bins on site. Mechanical harvesting requires that the string and vine together are cut at

top and bottom, placed carefully on a field trailer and transported to the harvester which is located in a shed adjacent to the hopground. The string and hop vine together are known as a hop 'bine'.

After harvesting, the 'green' hops are dried in kilns which use oil-fired furnaces and forced-air blowers to circulate heat. Green hops are reduced in weight by up to 75% during the drying process. After they are dried, the hops are either baled or passed through a pelletizer for compressing before being packed in vacuum-packs or nitrogen-flushed packs to reduce oxygen content and enhance storage quality of the product.

Cultivation of hops requires virtually continuous inputs of labour year-round (Burgess, 1964; Davies, 1973), with a seasonal peak at harvest time. After harvesting of the bines, hop plants become dormant, usually disappearing entirely to the rootstock during the winter months. In the period prior to the last decade or so, this rootstock was uncovered early in the winter and pruned or trimmed by hand to reduce excessive growth the following year. For this task the soil was pulled back to a depth of about 60cm and the woody roots trimmed with a hand tool, the soil then being replaced. This process was repeated of course about 2,965 times per hectare of hopground. Since about 1973 however, this process has been almost entirely discontinued, particularly on the large hop holdings, in favour of the use of herbicides to reduce unwanted shoots from the plant and weed growth. In the 1950's and 1960's mechanical dressers were used on some properties but root damage was occasionally a problem with unskilled use of these machines.

Because they are heavy feeders, hop plants require large

quantities of fertilizer. Until recent years most of this was supplied from animal manure but this has now been largely replaced in Tasmania by the use of commercially produced chemical fertilizers. Application of fertilizer is carried out mainly in the spring but continues through the growing months.

From spring through to harvest time hops require intensive inputs of labour. The vines must first be trained manually by turning each one several times clockwise around the twine or plastic string. Unwanted vines are removed, but one or two spare ones per hill are left to replace any which are damaged by wind or other cause. Wind frequently dislodges the head of the vine from the string, again necessitating a manual training operation which may involve hundreds of vines per hectare.

Harvesting of hops formerly involved up to 10 persons per acre for several days. Some families managed to harvest their own five or even 10 acres (2 - 4 hectares) by hand (5 acres was a fairly typical holding until the last decade), but this was only where very large families were available and usually involved relatives and friends not otherwise engaged in the industry; more typically, seasonal workers were required on all but the smallest of hop enterprises. In the last decade, the work of up to 500 seasonal pickers can be undertaken by 30 labourers and one of the largest hop harvesters. Such machines can readily serve 30 or more hectares each, resulting in considerable economies of scale. Cost savings of 10% of total unit production costs on farms of over 12 hectares were found to result from mechanical harvesting in 1970 (Makeham, 1970).

Other labour inputs in the production of hops include the operation of irrigation systems, spraying for control of

pests such as the red spider, field cultivation work, replacement of poles and wires due to deterioration and replacement of diseased or damaged plants. For the latter task, as with initial planting of a hopground, 'hop sets' are cut from the roots of existing healthy plants; hop seeds rarely run true to strain and are therefore an unreliable means of obtaining desired characteristics. The set consists of about sixteen cm of root and a healthy shoot which becomes the first vine of the new plant.

The economic context

Historical analysis of the hop industry in Tasmania reveals that until the advent of mechanized harvesting the majority of hop holdings were small (4 hectares or less), many owners preferring to avoid the cost inputs of full-time labour and associated increases in inputs of land under hops or other enterprises and capital necessary to justify the employment of full-time labour. Large hop enterprises which employed full-time labour do not appear to have benefited from economies of scale until they had at least 12 hectares under hops (Grower survey, 1977).

The advent of mechanized harvesting however was probably the single most significant cause of the substantial structural adjustment and relocation of much of the industry that has characterised the last two decades; small growers who were in a position to have co-operatively purchased mechanical harvesters did not do so, and their market was taken from them when oversupply occurred in the early 1970's. Prior to 1960 over 80% of hop farms in Tasmania had less than four hectares in hops, and the vast majority had only 2.02 hectares (5 acres) or less.

Usually within the industry it was considered that one man's full-time labour was required for 2.02 hectares of hops. At various times many farms have operated with much less than this area of hops, and some growers have made a satisfactory living from as little as 1.01 hectares (Grower survey, 1977).

In addition to the relatively small scale of most hop enterprises, the majority of hop farms were dependent either entirely or almost entirely on this activity for their income. Particularly before about 1968 some farms had diversified activities, and since that time several of the large farms have maintained their diversified enterprise structure, but in the majority of cases hops constituted the major source of income and demanded the major portion of inputs of labour and capital.

Since 1968 however, there has been a dramatic decline in the number of small hop farms in Tasmania while new, large farms have been established to take advantage of changed economies of scale made possible by mechanical harvesting and improved processing techniques.

Analysis of the economic conditions under which these changes have occurred involves a detailed consideration of production costs, and returns to capital, labour and management in the various hop farm size classes. From such an analysis it should be evident that hop production has at various times been particularly rewarding for some producers while the cost-intensity of the activity has meant that for less fortunate growers losses have sometimes been very heavy.

Before proceeding to an analysis of returns to growers,

however, the profitability or otherwise of hop production must be seen in both the context of the capital investment required for the enterprise and the context of alternative enterprises available to farmers for similar inputs of land, capital and labour or substitutions thereof. A theoretical capitalized value of existing hop farms may be arrived at by examination of data relating to various time periods within the last decade and with appropriate allowances for changes in costs to farmers by reference to the Index of Farm Costs as published by the Bureau of Agricultural Economics.

Establishment costs for hopground

The cost given by Pearce (1976) for establishment and operation of hopground for the first three years (it usually takes from two to three years before a commercial crop is produced) in 1968 was $5,000 per hectare. This amount included the cost of a kiln, but not of a mechanical harvester, other farm buildings or the dwelling; exclusive of land costs it would be similar to costs of expansion of an existing hopground at the time. Former hop growers have confirmed that at this time many small producers having a mere two hectares of hops were able to earn a reasonable livelihood with hop-related capital investment of as little as $10,000 in addition to the cost of land and dwelling. Although kilns were not generally owned by small producers there were other overhead costs such as farm vehicles which tended to be higher on a unit area basis for the smaller producer. Undoubtedly however, capital invested on the small hop farm at this time was often no greater than that required for medium-size arable farms such as those producing vegetables for canning. Nevertheless, even a medium-sized hop farm having 10

hectares of hops at this time would have been more costly to establish than would an arable farm growing say peas, potatoes or grain on say 60 hectares (Davies, 1977). Between 1968 and 1973 the Index of Farm Costs for Australia indicated cost increases of 39.8%. However, no precise details of cost increases for hop farms were available for the period. Nevertheless, in 1974, from taxation returns of growers and from farm accounts, the McColl survey of the hop industry determined that for a 12-hectare hop farm the capital invested per hectare, without annual operating costs, was $13,467. This figure was derived as follows:

TABLE i

CAPITAL INVESTED PER 12-HECTARE HOP FARM

| | Capital invested per hectare $ |
|---|---|
| Land and dwellings with trellises and irrigation equipment ($90,000) | 7,500 |
| Picker and associated shedding ($36,000) | 3,000 |
| Kiln, fans, blowers etc. ($24,000) | 2,000 |
| Vehicles and farm plant ($13,500) | 1,125 |
| TOTAL | 13,625* |

*Data converted from acres - the actual total was given as $5,450 per acre (x 2.471 = $13,467 per hectare)

Source: McColl, (1974), 10.

With cost increases for farmers generally from 1973 to 1978 of 87.7%, (Bureau of Agricultural Economics, Farm Costs Index; 1961-63 = 100, 1973-74 = 165, 1978= 310)the cost of establishing a new hop farm will be seen to have risen to virtually prohibitive proportions. There are, of course, economies of scale within the industry, and costs for very large hop enterprises would be lower on a unit-area basis. While it is not appropriate simply to apply the index of general farm costs to hop farms, sources within the industry confirm that for smaller

and medium-sized hop enterprises newly establishing, the initial capital cost is likely to exceed $17,000 per hectare. Operating costs for the initial unproductive years would add at least $3,000 per hectare, so that a hypothetical 12-hectare hop farm establishing in 1978 would cost some $240,000. Given the present size-distribution of hop farms in Tasmania in 1978, a 12-hectare farm would not be considered large; in 1973 the McColl survey found that farms of over 20-hectares of hops achieved considerable economies of scale, and continued expansion of the area under hops on some large farms since 1975 indicates that cost advantages have clearly shifted to the large hop enterprise since the advent of mechanical harvesting.

In contrast to the determination of costs of establishing new hop farms is the task of determining the cost of expansion of existing hopgrounds on existing farms. Again, a hypothetical situation would need to be employed as costs are variable in a number of ways. Assuming that a farmer owned the necessary land and that it was already cleared, the main costs are the capital costs of poles, the overhead trellis wires and straining cables. Hop sets would be freely obtained from his existing hopground, and would require only the labour for obtaining and planting. The irrigation system would also be costly for both materials and labour. Most other cost inputs could be regarded as operating costs; these include the cultivation and fertilizing of the hopground and the tying up of the twine for the first crop. It is estimated that for such a farmer, costs of expansion would vary between $5,800 and $7,500 per hectare, before the costs of production were taken into account (Davey, 1977; Ross, 1977). This variability relates to the extent to which paid labour was employed and to inputs such as hop poles

which may have to be purchased or which might be cut on the farmer's own land. Operating costs for the initial two to three years prior to the first harvest would add from $2,500 to $3,000 per hectare, again depending largely on labour inputs and other variables such as interest on initial capital expenditure. With expansion costs for existing hop farms likely to be around $10,000 per hectare compared with perhaps twice this amount for newly established hop farms it is quite possible that further expansion of existing hop holdings may occur as economic conditions within the industry improve.

With the cost of establishing and operating a 20-hectare hop farm likely to be well in excess of $300,000 before a return is obtained it is evident that in comparison with alternative forms of arable farming available in Tasmania hop farming must be regarded as a costly undertaking. In 1978 it is possible to purchase viable mixed crop and livestock farms and even dairy farms for less than $250,000 (Lands Dept., 1978), and the cost of establishing a large hop farm of say 50 hectares is likely to exceed the prices paid for some of the substantial grazing properties which have been sold for around $500,000 in 1978.

When the cost of establishment of new hop farms in 1978 is considered against the costs of production and returns to growers in different farm-size categories with prevailing prices it becomes evident that hop production is no longer a viable activity for small producers.

Production costs and returns against hop farm size

The McColl survey of production costs in the 1973-74 season (see Table ii) used three size classes for hop farms based on output of hops. The 0 - 9,091 kg size class would include most small farms of up to 4 hectares and some larger than this. The per kg production cost of 160.36 cents would have meant a profit of just over 50 cents per kg had all the crop been disposed of on the domestic Australian market at the 1973 price of 211.2 cents per kg. This would have left a farm income of $10,000 after the basic $5,000 included in calculating production costs at the upper end of the size class. However, from 1973 to 1978 a considerable proportion of Tasmanian hops has been sold on the export market at perhaps half the domestic price. Thus many farms in this size class would be unviable unless given at least a proportional share of the domestic market (around 65% to 70% between 1973-74 and 1976-77). At the upper extremity of the intermediate production size (45,455 kg) the costs of production were found to be higher at 165.66 cents/kg. Hence again most of the crop would need to be sold on the domestic market before profitability could be assured. The cost savings referred to previously for the largest size category were in the order of 10% so that as much as half the crop could be disposed of for the lower export price before the viability of such a farm was threatened. In fact, several of the very largest farms are owned by the marketing agent (known as a hop factor) which naturally sold its own hops first on the domestic market ahead of those of the small producers.

In approximate proportion to the general rise in hop-farm costs between 1973 and 1978 (B.A.E., 1978) the price paid for hops on the domestic market rose to $2.86/kg. Thus the

TABLE ii COST OF PRODUCTION AND INCOME, 1973-74, BY PRODUCTION SIZE OF HOP UNIT

| Production costs | Production size of hop farm 0 - 9,091 kg ¢/kg | 9,092 - 45,455 kg ¢/kg | over 45.455 kg ¢/kg |
|---|---|---|---|
| Paddock costs - (Fertilizer, chemicals, string, plant reoairs, power fuel etc.) | 17.36 | 25.74 | 21.91 |
| Harvesting/drying; excluding permanent labour - (Fuel for furnace, power, alpha acid testing, contract labour) | 52.67 | 30.87 | 19.73 |
| Labour cash costs - (permanent, casual, workers' compensation) | 12.65 | 50.56 | 66.99 |
| Marketing costs - (Insurance, bales, freight) | 3.06 | 3.04 | 3.28 |
| Imputed overhead costs - (Owner's labour: basic allowance = $5,000 p.a. contribution index; | 48.62 | 21.1 | 6.6 |
| Depreciation - (Buildings, trellis, hop equipment, general, etc.) | 16.96 | 24.55 | 22.24 |
| Cash overhead costs - (Rates, insurance, business administration, repairs and maintenance on improvements, water, miscellaneous) | 9.04 | 9.79 | 8.87 |
| TOTAL PRODUCTION COSTS PER Kg DRY WEIGHT | 160.36 | 165.66 | 149.62 |

PRICE PAID IN AUSTRALIA, 1973: 211.2 cents per kg.

Source: McColl, (1974). 15 -21. *

* data converted from lb. dry weight, and tables combined and simplified

hypothetical 20-hectare hop farm discussed previously could expect to produce 45,240 kg of hops per year (1968 - 1977 mean yield of 2,262 kg/hectare for Tasmania) at a cost of 248 cents per kg (allowing for 50% increase in production costs since 1973-74).* Hence production costs would total some $112,195 and probable returns assuming the entire crop was sold at the domestic price would be $129,386, leaving farm earnings at $17,191 plus $5,500 included in production costs for the owner's labour. Total returns are thus about $23,000 on a capital investment of over $300,000. Clearly, this hypothetical owner would need to enlarge his holding of hops in order to take advantage of scale economies, or hope for substantial price increases which are unlikely in the present situation of over-supply.

Alternatives to hops

Because of the specialized nature and cost-intensity of the hopground on hop farms relatively few hop farmers had either time or capital resources sufficient to permit serious involvement in other commercial activities. There were exceptions in all size classes; particularly on the large farms, capital accumulation seems to have permitted diversification into such activities as orcharding or livestock enetrprises. Even here however, the capital requirements of the hop enterprise normally amounted to over 75%

* Bureau of Agricultural Economics, (1978), Quarterly Review of the Rural Economy, Intro. Issue, 56 indicates general farm cost increases of 87.7% for the period. The index value in 1973-74 was 165 and in 1977-78 it was 310. However, hop farmers interviewed as at March, 1978 stated that their costs had risen in approximate proportion to changes in the C.P.I. for the period; in other words, fractionally over 50%. Had costs risen by 87% in the period, no hop producer could have produced hops profitably unless 100% of the crop was disposed of on the domestic market.

of total capital invested. Exceptions to this pattern are found in 1978 in the north-east of Tasmania where mixed farms include a dairy-hop farm and a mixed cropping enterprise where hops constitute only 30% of farm inputs. In the south of the state one large farm still has significant orcharding interests in addition to a hopground area of almost 50 hectares, and one dairy farmer has about three hectares of hops. In several cases in 1978 off-farm income supplements income from hops but this situation has not been typical of the industry in the past.

Due to the vastly increased capital inputs required on hop farms within the last decade, it is evident that specialization in the crop is increasing. In 1978, over 70% of hop farms in the state had no other commercial activity. While relatively few hop farmers in the past had other substantial commercial enterprises, in some regions of the state smallfruits were grown in conjunction with hops by perhaps half the hop producers, and many hop farms have had some livestock grazing over large areas of wooded or semi-cleared hillsides surrounding the valley floors on which their hops were mainly produced. However, an acreage of smallfruits such as blackcurrants or raspberries equivalent to the acreage in hops on a small mixed hop and berry fruit farm would represent a balance of 85% of capital investment and perhaps over 90% of farm income in favour of the hops (Grower survey, 1977). Very few hop farmers in the Derwent Valley attempted to cultivate more than two hectares of smallfruits, and many had less than half a hectare in such crops. In recent years some former hop growers have turned to full-time production of black currants for juice, this enterprise requiring labour and capital inputs well below those for hops on either an areal or total farm basis. However, very few hop growers left the

industry with the necessary capital resources to invest in alternative specialized crop enterprises such as black currants, and those that had some capital have not been able to establish more than a minimum acreage in the crop (Grower survey, 1977).

Despite examples of diversified farms which produce hops in 1978 the trend towards increased specialization is evident from the number of hop farms which have eliminated all other enterprises in recent years, particularly in the Derwent Valley. Specialization is also apparent in terms of areas of the state which have seen increased concentration of the crop at the expense of other localities where production has declined. To some extent however, the latter trend may simply reflect the contraction of the extensive margins of production for the crop; a pattern noted historically within the industry coincident with periods of market over-supply.

True diversification of farms growing hops was rare; more often, hop farms which had other enterprises had hops as the major activity and one or more relatively very minor associated activity. It was this near-total dependence on hops that led to the very dramatic effects on the farms when the market for the crop declined; had there been viable alternative enterprises available for such smallholdings, undoubtedly many farmers in the south of the state would not have gone out of business.

The core-margin concept

Analysis of the historical development of the hop industry in Tasmania reveals the dominance of a relatively restricted and fairly clearly identifiable hop production locality in the middle-Derwent Valley - the core; and the presence of a fluctuating boundary within which hop cultivation occurred. These fluctuations

represented periods of outward expansion of the activity at favourable periods within the industry and contraction towards the core whenever serious economic downturn arose for the producers of the crop as it did in the mid-1880's, the late 1920's to early 1930's and the early 1970's. In recent years, a second, quite separate 'core' locality appears to have emerged in Tasmania's north-east. Both core localities have gained increased percentages of total regional production during the current period of contraction within the industry; both have tended to have expansionary impetus at times of assured markets and/or higher prices for the crop.

Hop cultivation in any hopground, whether a small farm or large farm, is approximately similar in terms of planting and cultivation techniques, and thus there is little variation in terms of land-use intensity. However, within the relatively loosely defined core localities field surveys and statistical evidence indicate that certain economic advantages favoured the development of 'large' hop farms which coincided with the availability of broad expanses of suitable land for the cultivation of the crop. For various reasons, including the establishment of large processing facilities serving peripheral localities, the core regions have both been characterised by much higher total capital investments than have the non-core production localities. In the latter, hopgrounds tend to be smaller and more dispersed. Unit inputs of land, labour and capital tended also to be lower in many cases, particularly where hops were sold to the central processors before they were dried.

The construction of kilns on hop farms seems to have varied fairly randomly against size of hopground up to about 4 hectares. Over this size, a kiln was normally warranted but there were many

exceptions where growers avoided construction of their own kiln. Because timber was often available on a farm for virtually the labour input required to obtain it, many farmers with small hopgrounds built wooden kilns. Mapping of existing kilns in 1978 would be of little value in demonstrating the pattern however, for several reasons. Many kilns have been destroyed either when in use, or subsequently, by fire. Fires have been frequent due to the nature of the drying process and also because kilns were often located where bushfires destroyed them. Larger kilns which remain from earlier periods tend to be more in evidence in the core locality than was the case in reality because they were more often constructed of brick and were part of established large estates which have not been either so prone to bushfires or have not been so likely to have suffered from insurance-related arson.* Nevertheless, old hop kilns are often the most readily identifiable relic feature of the hop enterprise with the possible exception of lines of Italian poplars on valley-floor fields. The latter were used as windbreaks and often remain long after hop production has ceased in a given locality.

In the sense that hopground occupied smaller floodplains, was more dispersed and was more likely to have been part of a less intensive hop enterprise in terms of capital inputs, the hopgrounds in the peripheral localities may be said to be more 'extensive', and the outer boundary of such production localities is referred to as the 'extensive margin of production'. By contrast, the 'inten-

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* It is widely reported by those within the industry that the number of kiln fires increased markedly in the early 1930's and early 1970's - both periods when hops could not be sold.

sive margin of production' refers to the core locality where production tends to be more intensive in terms of capital inputs, particularly if processing facilities for more distant growers are taken into account as part of the enterprise structure in this locality.

The notion of marginal producers being more distant from the core locality appears to be well supported by the spatial expansion and contraction of production which coincides with the various periods of growth and collapse within the industry, the latter occurring in three main cyclical periods; the mid 1880's, the late 1920's - early 1930's and the early 1970's.

Hop marketing

Sale and disposal of hops to the brewery trade or on the export market has normally been undertaken by marketing companies known in the trade as 'hop factors', or simply as a 'factor'. These companies grew from the need for growers to be assured of an outlet for their crop and from growers' needs for information and assistance with production. The factors often assumed the role of supplier of requisites not otherwise available on the farm, the cost of such items as string, wire, poles, and fertilizer being held over against the farmer's returns from his crop.

As a result of the marketing arrangements which developed in the industry, growers were removed from the need to understand the rather delicate supply/demand relationship which prevailed within the industry; growers were therefore often quite unaware of impending over-supply situations and were sometimes the last to learn that there was no demand for their crop. Many growers came to depend upon the factor for advice on farm management and hop cultivation to such an extent that at least one factor in Tasmania

had a full-time advisor for such day to day decisions as the best time to spray for pests, fertilize the crop or even to harvest. Growers often relied on the factor for advice, rather than communicate with each other on problems and methods of production.

This situation was compounded by the fact that several factors at various times and one major factor from early this century were also hop growers themselves. The potential for conflict of interest was therefore considerable; the involvement of factors as growers was considered undesirable by the Makeham Report in 1970 and also by the McColl study in 1974. By 1978, only one factor remains in the industry, but this factor owns a very high percentage of the hopground in the state. In fact, this factor appears to have prospered, expanding its own holdings while small growers have been told that there was no market for their crop.

There have been some benefits within the industry from the existence of the hop factors. Small growers were able to enter the industry in the mid-1930's because of the existence of the large, central, factor-owned kilns for drying their hops. The capital investment needed for small farmers has therefore been lower than would otherwise have been the case. Quality control in the processing of the crop has also generally been assisted by the existence of the experienced operators in the larger kilns.

Factors have had enormous effect on the location of new hop acreage by controlling acreage expansion through a contract system; growers have been contracted for specific acreages and total amounts of production; penalties have existed for either acreage expansion or excess production (in bumper crop years a lower price might be paid for the surplus production, depending on market demand). Factors well understood the market situation, and

for much of the history of hop cultivation in Tasmania have managed to keep the total Australian production of the crop slightly below the level of domestic Australian demand. This has meant that brewers have had to import higher-priced hops. However, seasonal fluctuations in yield, changing beer consumption trends, new high-alpha hop varieties, mechanical harvesting and changed economies of scale for production have all at one time or another led to imbalances in the supply/demand relationship. When oversupply has occurred within the industry, prices have collapsed and/or small growers who lacked kilns and possible direct access to markets have been told that their hops could not be sold. Few such growers therefore, have been able to survive during periods of downturn within the industry; usually located at some distance from the core locality, they have had no alternative but to cease production.

## Conclusion

Analysis of internal structural changes within the Tasmanian hop industry and spatial changes which have resulted partly from such internal changes and partly from external physical, economic, political and social factors requires a fairly detailed understanding of the particular technological and economic attributes of the industry. It has been possible only to give an outline of the nature of the industry to this point. However, much of the information provided in Chapter I by way of an overview of relevant spatial considerations will incorporate further elaboration of pertinent technological and economic aspects of the industry.

# CHAPTER I

## THE APPROACH

### Rationale for the study

Single crop-type studies are not rare in the literature of agricultural geography (Kelly, 1971; Turner, 1972; Watts, 1974; Buchanan, 1975) but almost all such studies involve either an industrial crop with highly localized production and associated central processing facilities or a crop of such widespread economic impact that macro-regional character is markedly influenced by its specialized attributes. The Tasmanian hop industry falls largely within the former category.

Concentration upon one crop, as opposed to regional studies involving crop combinations (Weaver, 1954) or crop and livestock associations (Coppock, 1964) or macro-studies of agricultural systems (Gregor, 1965) allows for the identification of crop-specific processes and patterns of agricultural land-use often subsumed in, but sometimes obscured in the broader studies. It is these processes from which may be derived process laws that constitute a necessary step in the formulation of deductive theories of agricultural land-use. Undoubtedly, the impact of specific physical, economic and social variables on the spatial arrangement of certain localized crop types is considerable. They may well be more readily identifiable than is the case with more ubiquitous crops and farming systems.

Three constraints within which the hop industry in Tasmania operates also make it an attractive study for geographic analysis. The first constraint is the economic one deriving from

the relatively limited market in Australia for the crop. Apart from the period from 1946 to 1972 when prices were regulated within relatively narrow limits according to production costs, in economic terms demand for the commodity has been price inelastic (Found, 1971) and the spatial implications of this situation have at times been quite dramatic.

The second constraint within which the industry operates derives from the high establishment costs for the perennial; as previously indicated there are expensive trellis systems, irrigation systems, harvesting and processing facilities in addition to the fact that the lead time can be up to three years before a satisfactory yield is obtained. Decisions by producers on such matters as expansion or contraction of planted area are therefore long-term and unrelated to such short-run considerations as year to year fluctuations in yield which may lead to cycles of over-production and under-production (Heady, 1952; Williams, 1967; Harris, 1974). Changes over time in the extent and distribution of the industry reflect changing internal and external economic conditions. This will be evident in the historical analysis of the industry and in the explanatory model developed in Chapter V (Fig. V.1).

A third constraint for the study is the fact that for the majority of producers hops formed the major source of farm income, in some cases constituting 100% of farm income and in even the larger diversified farms still constituting over 50% of farm income (Makeham, 1970; author's survey, 1977). Thus there was often no viable alternative enterprise for hop farmers and the question of sub-optimal decision-making relates essentially to internal farm management decisions such as changes of variety, or different fertilizer applications or changes in planted area.

Since the beginning of commercial hop production in Tasmania in the 1820's, the industry has periodically aroused considerable interest from newspapers, politicians and official sources because of its substantial impact on the economic and social environment within which it operates. Historical analysis of the Australian hop industry has been undertaken by Pearce (1968; 1976), but apart from brief studies by Scott (1957; 1961a; 1965) there exists no spatial analysis of the industry in Tasmania. One of the major difficulties of such a study however, is the inadequacy of some of the data that are available and the virtual absence of other data such as detailed micro-climatic records. The deficiency is a recurring theme in the study, but it is hoped that through the analysis that is achieved some of the shortfalls in the existing systems of data collection will be highlighted. In the event, a more detailed quantitative analysis would assist to develop further the major themes of the present study.

## Theoretical considerations

This study is dichotomized between an examination of the historical evolution of hop production in Tasmania and an analysis of the present period in which structural adjustment and regional relocation of unprecedented proportions are paramount. It is argued that only by examining in detail the particular and peculiar locational influences and resultant spatial arrangement of the industry that characterised earlier periods can the geography of the industry in the present period be adequately encompassed. Sauer, (1952,1) pointed out that geographers:

> "are dealing in large part with the observations of the present that originated in a past which does not come again, or which cannot be verified experimentally ... yet if we are

> trying to learn about the changing, man-inhabited world, human geography must take the risks of interpreting the meeting of natural history and cultural history".

The precise role of historical geography and consequently the forms it should take are still matters of debate, (Harvey, 1969; Moodie, 1976) but the vast extent of the geographic literature which employs historical approaches and methods such as the many evolutionary models of spatial patterns (Chorley and Haggett, 1967) and the international acceptance of this branch of the discipline (Baker, 1972) evidence its indisputable role. Whether one argues that the methodological justification for historical analyses rests on the interaction between fact and theory as Moody and Lehr (1976) do or on the central role of synthesis as Harris (1971) does, most geographers would find little to dispute with Harvey (1969, 430) when he states that:

> "the scientific model ... elaborates a scientific schema which shows the necessary and sufficient conditions for a given state to be predicted from an anterior state".

The main problem, as Harvey sees it, is the difficulty of adequately describing the sufficient conditions when dealing with historical times so that instead of developing true process laws the confusion of necessary conditions for sufficient conditions leads to the development of "psuedo-process-laws in the form of historical sequences" (Harvey, 1969, 431) with the result that the true nature of the 'historical' explanation being expounded is misunderstood.

In recognition of the foregoing difficulties it is argued that a micro-scale study of a localized crop-enterprise such as the hop industry in Tasmania offers the prospect of resolving some of the difficulties inherent in studies of more

widespread phenomena where the sufficient conditions are less capable of identification. Process laws which may be developed from micro-scale studies may lead ultimately to the formulation of workable deductive theories of agricultural land-use. As Harvey, (1969, 38) points out:

> "Science attempts to organize its propositions within a deductive frame of inference ... the deductive form of scientific theories must be regarded as the end-product of scientific knowledge, rather than as the mould into which all scientific thought is cast from the very initiation of an investigation".

The point is elaborated by Baker (1972, 22) who comments on the inseparable nature of inductive and deductive approaches to scientific enquiry, and states that:

> "deductive theory needs frequent reference to the real world if it is to have any practical and interpretive value, just as empirical enquiry directed toward lawlike statement must feed on more abstract theory".

In so far as it is possible within the constraints of the available data to verify a 'more abstract theory' it is proposed in the study of both the historical development and the present distribution of hop production in Tasmania to make frequent reference to traditional normative economics as detailed by Found (1971). Of particular importance in this regard is the concept of price inelasticity of demand. As stated, this concept refers to the ratio of percentage change in quantity of a product demanded to the corresponding percentage change in price along a given demand schedule. This can be determined by the formula:

$$Ep = \frac{(Q1-Q2)/(Q1+Q2)}{(P1-P2)/(P1+P2)}$$

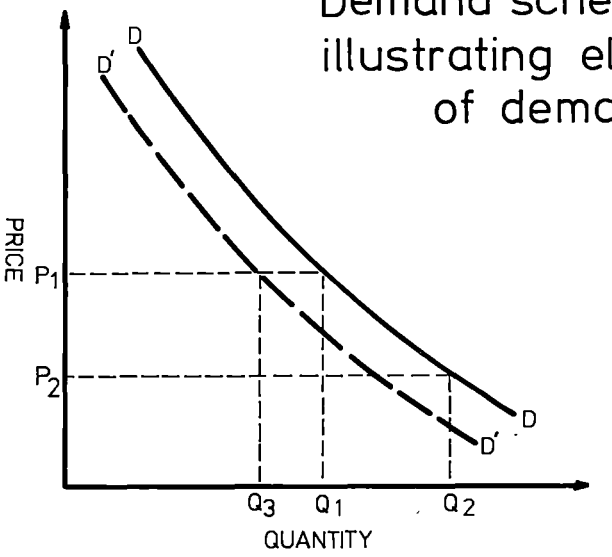
where: P1, P2, Q1 and Q2 correspond to prices and quantities at

two points on a demand schedule (see Fig. I.1). The applicability of this concept rests on the nature of the specific industrial demand for the crop and the resultant sensitivity of price to changes in the level of supply. Although since 1946 there has been general price agreement within the industry in recent years when over-supply occurred the effective 'price reduction' was borne by scores of small and medium-sized producers who were forced out of production by being excluded entirely from the market; had the market been shared on a competitive basis between all growers there would certainly have been a considerable price decline.

Changes in the level of supply of hops from year to year occur for a number of reasons including seasonal variations which markedly affect the hop plant *(Humulus lupulus)*, localized calamities such as floods or fires, the incidence of pests such as the red spider and the characteristic behaviour of both growers and brewers in response to perceived future supply and demand relationships. A relatively predictable Australian domestic demand for hops is offset to some extent by the fact that brewers have always tended to import some of their requirements. From time to time, and particularly in the last decade, Tasmanian hop producers have exported some hops overseas. However, year-to-year fluctuations in supply due to marked yield variations have tended to be 'smoothed' to some extent by the fact that hops may be used for several years after they are cured and since 1975 this period has been greatly extended by vacuum-sealing or nitrogen-flushing of pelletized hops. A carry-over of hops from a year or two of surplus production has thus tended to regulate prices. Nevertheless, long-term trends towards over-production have occurred in remarkably regular cycles

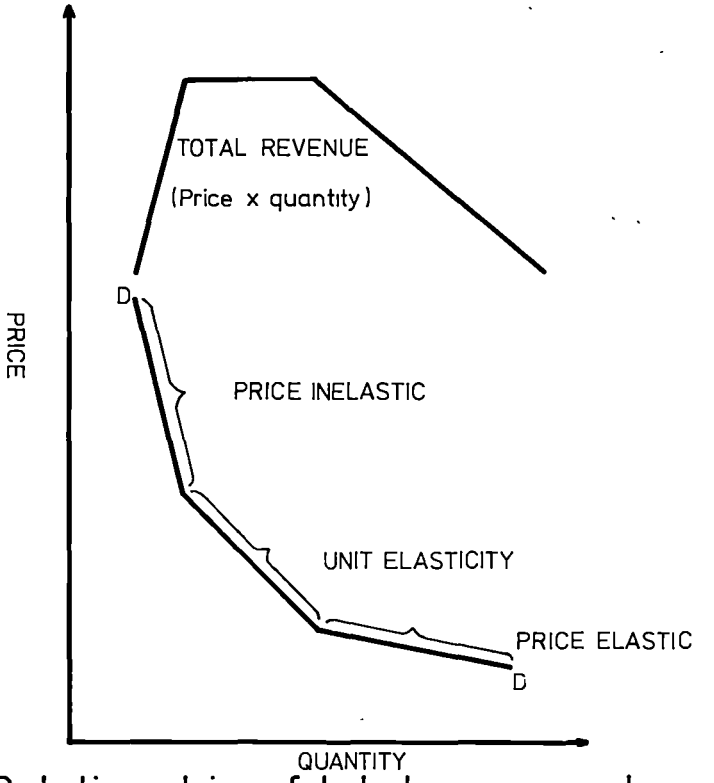
Figure I.1

Demand schedules, illustrating elasticity of demand




SOURCE:
FOUND, W.C. (1971), 5.

Figure I.2




SOURCE:
FOUND, WC (1971), 7

Relationship of total revenue to price elasticity of demand

and usually have related to acreage expansion rather than to seasonal fluctuations in yield; the results have invariably been catastrophic for less efficient growers as well as for many of the more efficient growers who have been forced out of production due to the particular marketing arrangements which have prevailed within the industry.

In Tasmania there have been as many as five or six hop factors at one time or another but most have been relatively small; only one factor remained during the critical period of collapse of the industry during the early 1970's. This factor is also the oldest in the industry, having existed since the early years of this century, and unlike many commodity merchants is also a grower of the commodity. Hop factors, including the large one in Tasmania, traditionally have contracted with growers either annually or over several years to buy their hops at a fixed price, but there were let-out clauses relating to the quality of the hops which virtually ensured the factor against being caught with unsaleable hops. The factor has also been a supplier of materials to the grower, the costs being deducted from the sale of the grower's hops. This has often given the grower little opportunity to move independently of the factor towards, say, co-operative purchase of harvesting machines. Some growers have, however, made sufficient profit from their hops that this group co-operation would have been possible - indeed several growers in the Derwent Valley discussed co-operation of this type during the late 1960's when conditions would have favoured such action. None of these growers is still in production in 1978.

The economic conditions within which the production and

marketing of hops occurs have been well understood by the hop factors as is evidenced by their concern to limit growers to specified quantities of the commodity (Geard, 1939) and by their frequent submissions to government that brewers be limited as to the quantity of hops that may be imported (Tariff Report, 1945).

The essential nature of the economic conditions prevailing within the Tasmanian hop industry derives from the fact that the industry is governed by the relatively stable and predictable Australian domestic demand. This market has grown steadily over time and although fluctuations occur in general accord with other factors such as economic conditions (Pearce, 1976) it is possible to predict fairly precisely the total quantity of hops likely to be required from one year to another.

Although particularly in recent decades Victorian production has increased considerably, thus reducing Tasmania's share of the market, some of the increased Victorian production has also been on hop farms owned by the leading hop factor in Tasmania, and the characteristic conditions of price inelasticity of demand for the commodity must be seen within the context of total Australian production and consumption. Apart from earlier uses in yeast-making and some minor medicinal uses the sole use of hops is in the brewing of beer. With the resultant predictability of demand for hops within Australia (excluding uncertain foreign demand) it can readily be seen that as "total revenue is the product of the quantity sold times the respective price per unit" (Found, 1971, 6) the key variable in the economic relationship is the quantity produced. Found (1971) also indicates that pure competitors often fail to realize that greater quantities sold do not necessarily lead to greater incomes (see Fig. I.2) and that with demand

being price inelastic greater quantities being produced and sold will lead to relatively greater falls in the price and lower total revenue. It may be debated whether hop producers in Tasmania have ever been 'pure' competitors; certainly in a situation involving competition for a share of a relatively fixed market demand growers may well have been powerless as individuals to have done anything to have altered their predicament. Nevertheless, a lack of understanding of the market conditions has been typical of many hop growers in Tasmania. The writer has interviewed all but three current producers in the state, and indirect information has been obtained from those growers not interviewed. Of the eight independent growers remaining in southern Tasmania five blame the advent of production in the Scottsdale region for the over-supply situation existing in the mid-1970's. In addition, 14 former hop producers either stated to the writer or recorded their opinion on a questionnaire that the Scottsdale production was to blame. Yet it was simply not understood or not mentioned by any former grower that the doubling of alpha acid yield resulting from new hop varieties - and for which improvement growers had neither sought nor been given any compensation - was at least as important as the advent of new growers and a new production locality.

As growers in the south of the state numbered so few - even at the 1968 peak, only 98 - it would have been possible for co-operative action to reduce their dependence on the one major hop buyer (two smaller factors existed in 1968, but less than 15 growers sold through them); growers were vulnerable to being used when demand was high and discarded when the factor had no further need for their hops. It was not simply a case of small growers not being efficient; previous surveys of the industry have found

some of the highest levels of efficiency among the small and medium-sized hop enterprises, and in the late 1960's and early 1970's small hop enterprises of only two or three hectares were commencing production in the north-east, taking advantage of co-operative sharing of kilns and harvesters. Six enterprises in the region had under two hectares of hops, one had 2.4 hectares and several of these growers were actually earning good returns from their enterprises at the very time that the smaller growers in the south were being told that there was no demand for their crop; the north-eastern growers were selling their crop through the Scottsdale Hop Marketers, a co-operative which was selling both on the export market and within Australia. Although the smallest hop enterprise in the north-east in 1978 has seven hectares under hops several of the small hop holdings in 1968 have been enlarged progressively so that by 1978 they fall into the medium or large categories. Although the over-supply of the market in the early 1970's arose partly because of increased production in the north-east of Tasmania and in Victoria, the increased scale of the newer acreages was not matched by growers in the south of the state who could have been co-operatively retaining existing acreage through amalgamation of smaller holdings and adequate compensation for those leaving the industry, thereby possibly pre-empting some of the expansion in newer localities. Interestingly, this co-operative pattern is precisely that which is emerging in the Derwent Valley in the late 1970's in relation to the blackcurrant industry; here, harvesting machines and related equipment are being purchased and operated by groups of farmers often located some kilometres apart.

Rather than expand total production during the late 1960's and early 1970's, the need was for stability of production, particularly in view of the improved hop variety being demanded by the

brewers. During the three major periods of over-supply which have arisen within the industry since it began in Tasmania the basic principle that farmers "actually gain larger incomes when production is reduced" (Found, 1971, 6) has applied. This point is clearly evident in a submission from one of the leading producers to the Tasmanian Hop Producers' Association in 1976 recommending a vine-pull scheme (Shoobridge, 1976).

Under the conditions outlined so far, it follows that the aim of each farmer should be to choose a production-function which will minimize unit costs rather than maximizing total production. Although the former course may well mean an increase in scale and hence of total production, that increase on a proportion of existing farms operated co-operatively would appear to have offered substantial benefits. Fewer farmers would have suffered financial ruin, and the risks associated with the heavy capital borrowings for new hopground construction and associated inputs as in the north-east of Tasmania could have been largely avoided. The foregoing suggests a degree of external management or intervention not characteristic of the hop industry in the past, yet it is precisely the formation of such management capacity through first the Scottsdale Hop Marketers Association and more recently the Australian Hop Marketers which has enabled the long-term future of existing growers to seem more secured.

When choosing an optimum production-function the factors of production - land, labour, technology and capital - may be considered as variable inputs as each is capable of being increased or decreased, although not necessarily in a uniform manner. The essential point is that:

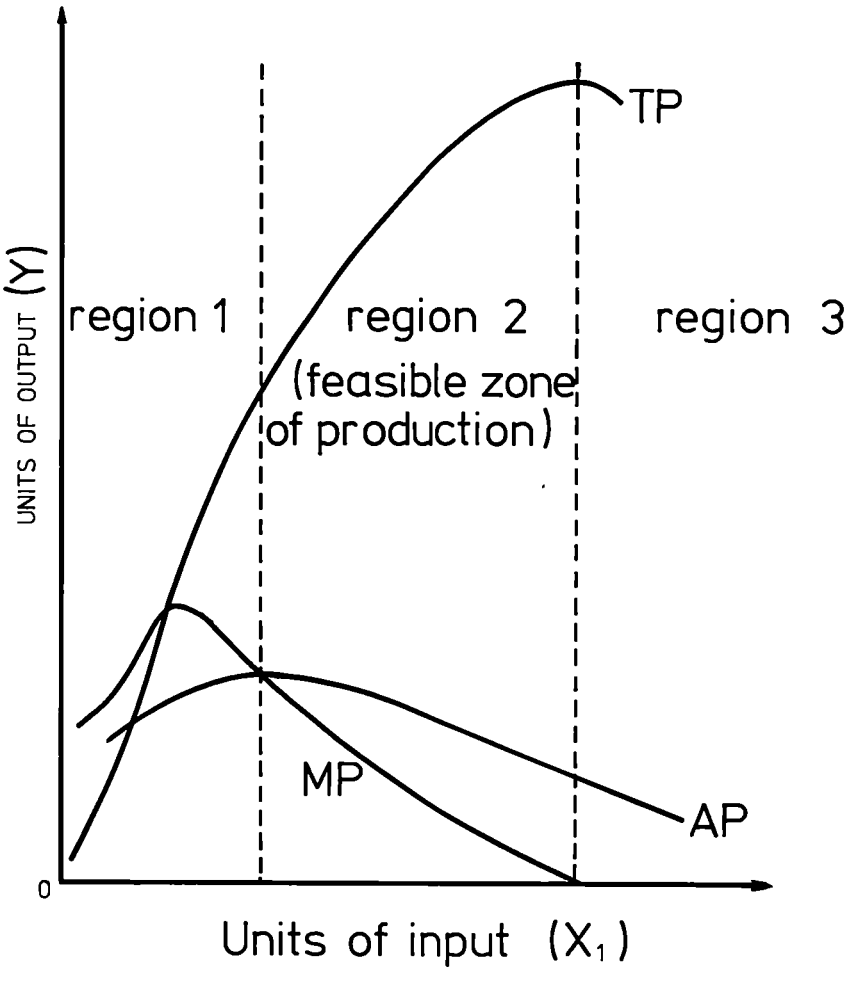
> "as the quantity of input is increased, the output or total product will first increase at an increasing rate, then at a constant rate and, after increasing at a diminishing rate, will reach a maximum production and then decline", (Found, 1971, 14).

Hence the law of diminishing returns may be seen to raise the possibility of optimum minimal and maximal factor inputs and relationships so that there may exist an optimum farm enterprise structure and farm 'size' (hopground size) for hop production in Tasmania. Of course, changes over time in prices and costs may lead to factor substitutions and possible changes in the optimum farm size.

From Figure I.3 the indexes known as average product (AP) and marginal product (MP) can be determined. Average product is the total product (TP) divided by the total quantity of inputs at any given input level. "Due to the characteristic shape of the TP curve, AP first increases, reaches a maximum and declines as the quantity of inputs increases", (Found, 1971, 14). The change in output which results from the last additional input is known as the marginal product. Again, marginal product increases rapidly at first, reaching a maximum, and then declines, becoming negative when maximum output is achieved.

It is quite apparent that there is a wide range of possible input combinations for hop production but there are finite limits at both extremes of the input range - i.e. region 2 in Fig. I.3 - and that these limits may change over time. It has not been possible to determine such limits with much precision but characteristic patterns involving on the one hand small family-operated farms with relatively low capital investment per farm unit contrast notably with large units having substantial capital and labour inputs per

Figure I.3




Production function and related indexes for $Y = f(X_1 | X_2, X_3, \ldots X_n)$

SOURCE: FOUND, W.C., (1971), 14

farm and which derive benefits from economies of scale that are only possible once a certain minimum size of hopground is attained. Hops, unlike many other crops, are not often grown as simply an optional additional crop on a mixed crop or crop and livestock enterprise; they tend to be grown most often on specialist farms which often have no other commercial activity.

In addition to the theoretical considerations of normative economics is a number of behavioural considerations which involve analysis of farmer response to change and farmer perception of market conditions and opportunities. It is apparent from the detailed interviews of some 35 present and former hop growers that they behave in certain ways according to the source of information that they receive; conflicting information from different sources has sometimes led to poor decision-making. However, because so many growers have left the industry and relevant data are somewhat fragmentary, detailed empirical investigation of the type undertaken by Hagerstrand (1966) was not possible in the case of the present study. Nevertheless, from farmer interviews and various historical records, it appears that at least in some cases certain farmers seem to be willing to enter into hop production or to expand their production if other larger growers have set the lead. The spatial pattern of hop production has at several times and in several locations exhibited something like the spread effect detailed by Hagerstrand (1966) with key growers taking the lead. Harvey, (1963) has pointed to the particular pattern of hop production in Kent in the nineteenth century, and for a number of reasons events in Tasmania and resulting patterns of hop production are recognizably similar, although on a far smaller scale than was the case in Kent.

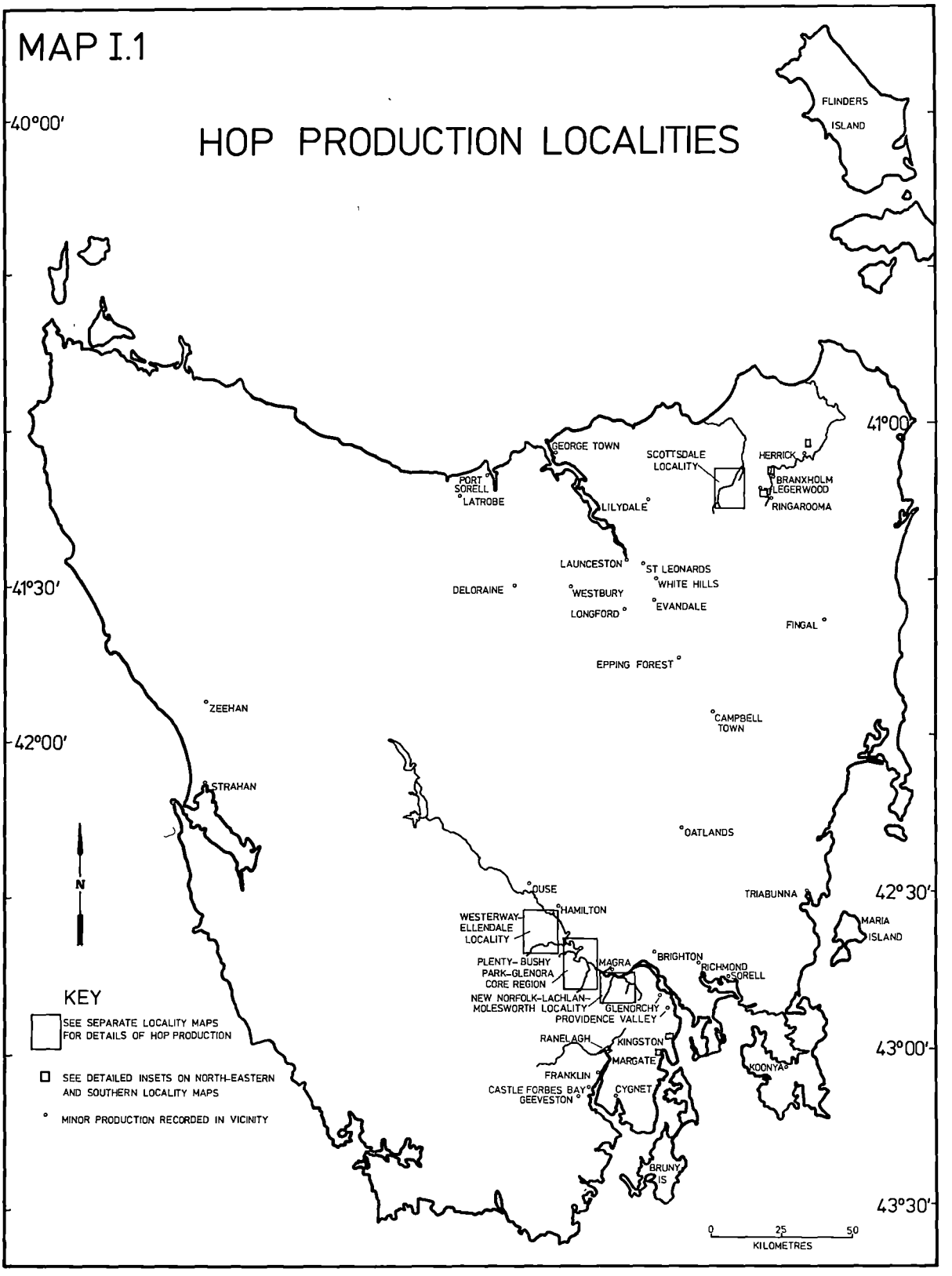
The attempt to bring together both normative economics and a behavioural study with its concerns for the psychological and sociological processes is certainly not new. In a review article, Harvey (1966) states that geographers are just at the beginning of the quest for intuitively satisfying models which will bridge the gap between the spatial models developed by economists and geographers and the behavioural models of the sociologists and psychologists. From this, "should come a general theory of agricultural location which is both operational and intuitively satisfying", (Harvey, 1966, 374). From interviews with hop producers it is apparent that the Theory of Games as developed by von Neumann and Morgenstern, (1944) and elaborated within a spatial context by Gould, (1963) and Wolpert, (1964) may have utility as a general concept but that the time-span involved means that little choice is left to the grower on an annual basis once he is established; he must cultivate and harvest his hops; the initial establishment costs and total investment in factor inputs demand a return which can only be obtained by working of the hopground. Initial establishment of hopgrounds however, seems to occur partly as a result of a conscious risk-taking decision on the part of the entrepreneur. Alternative crops exist and the risks are lower; so are the possible profits.

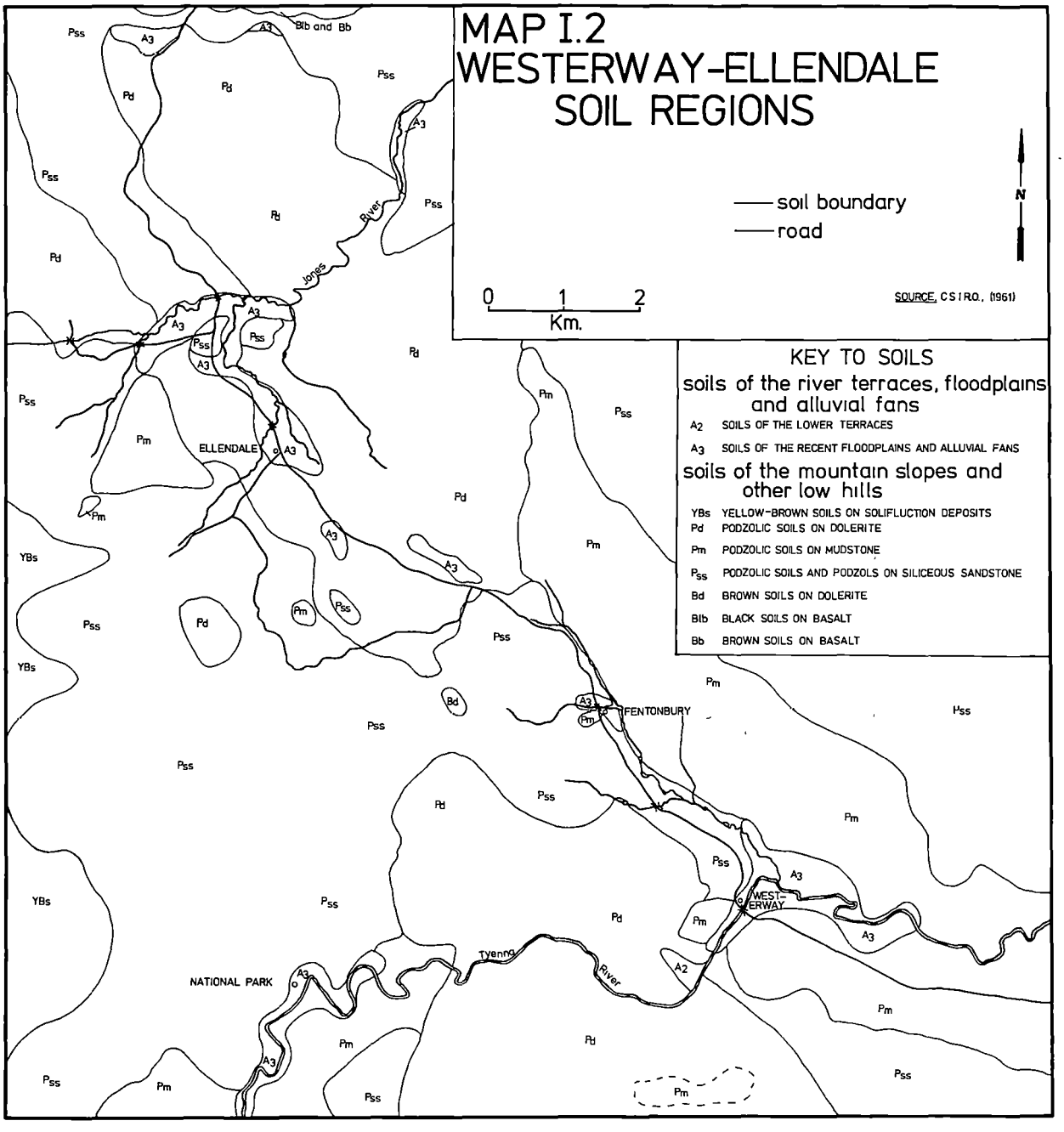
Before proceeding to a description of the methods employed in the study the spatial impact of the physical, political and economic environments within which the Tasmanian hop industry has operated should be considered in some detail. The three elements are inter-related and have particular relevance to the decision framework; whether normative or behavioural.

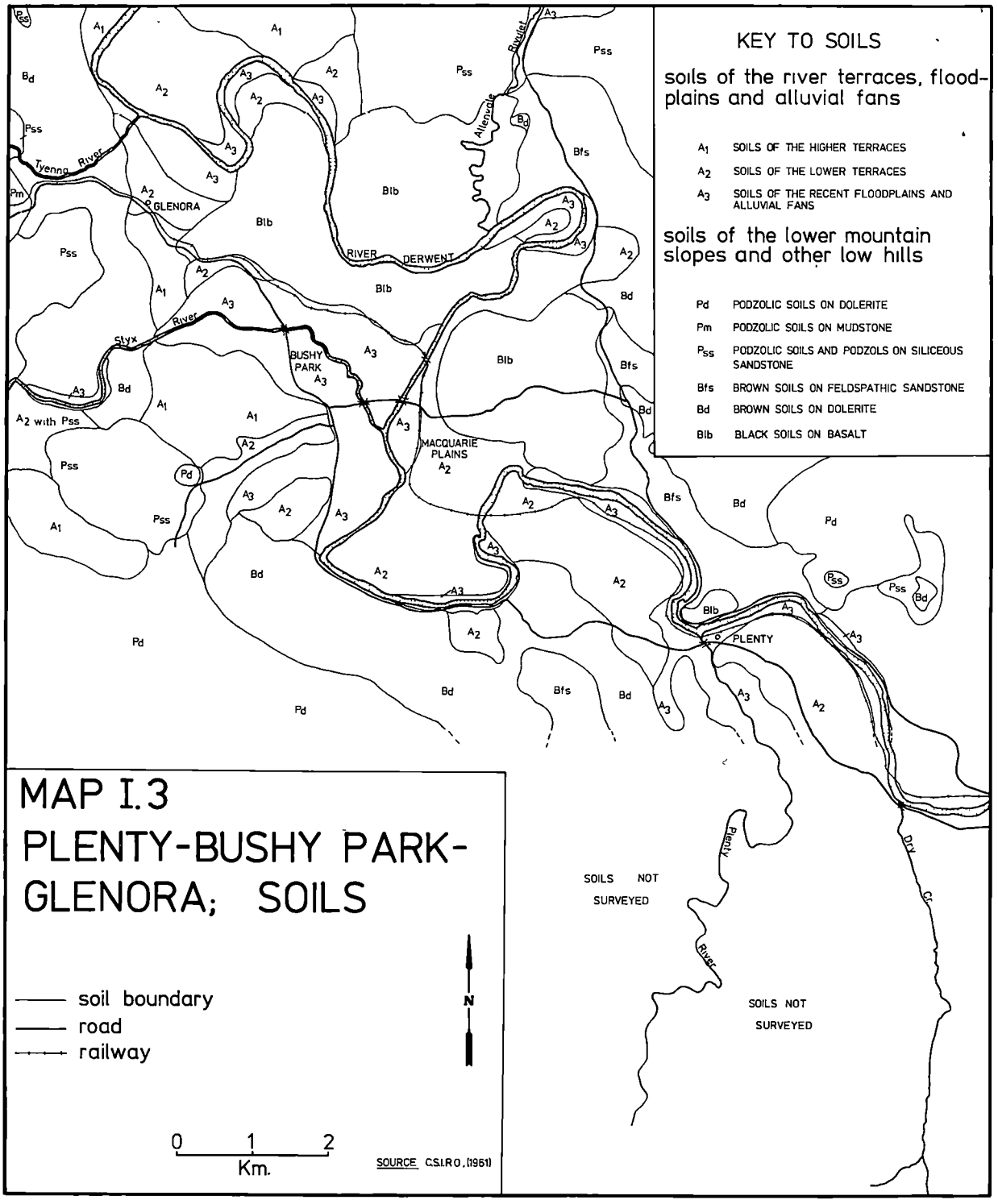
The physical setting

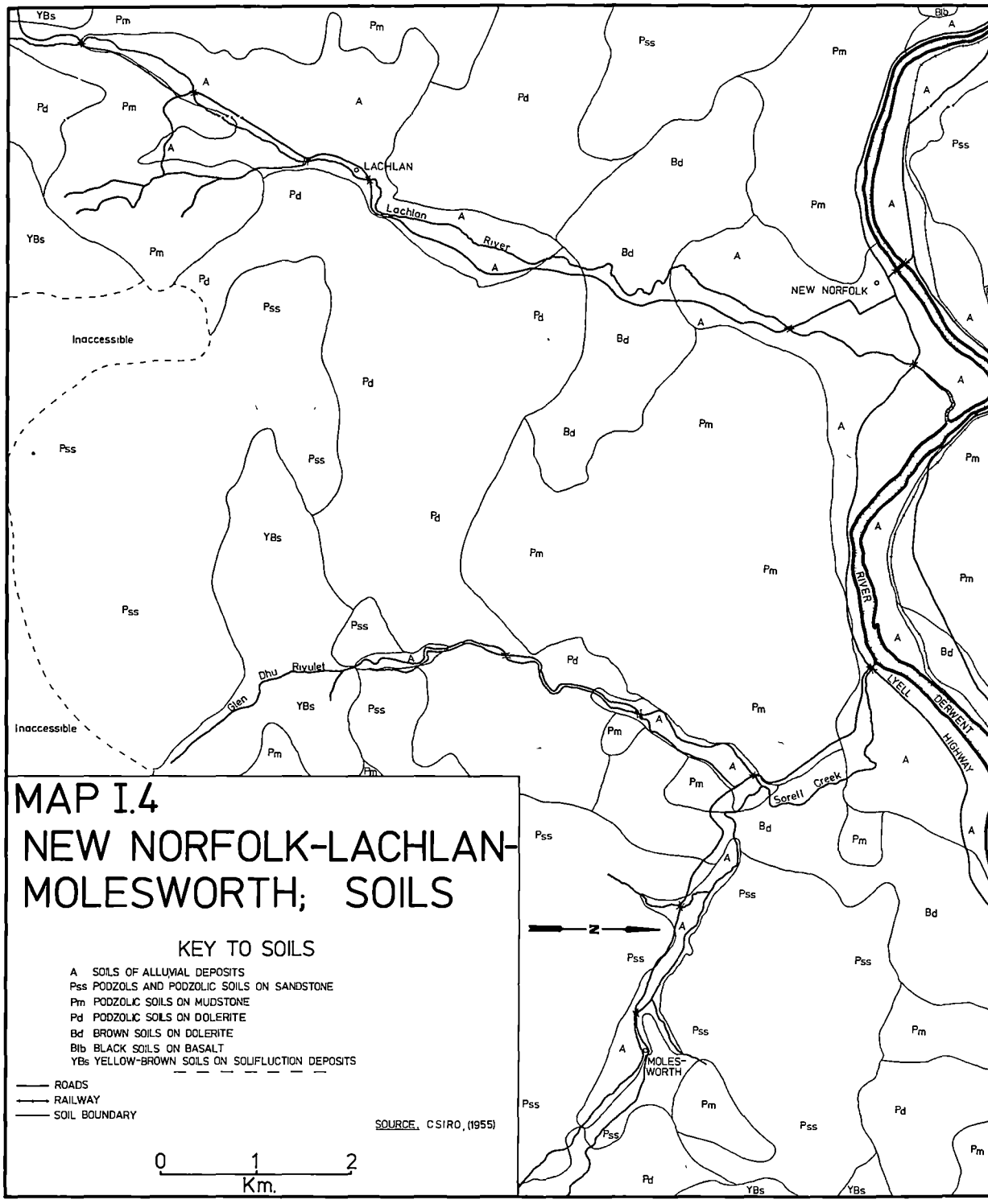
Of the physical constraints affecting the location of hop production, latitude, climate, soil and relief characteristics are significant. The latitudinal limits for successful flower induction in *Humulus lupulus* are relatively narrow; about 37 to 54 degrees (Burgess, 1964). Tasmania lies entirely within this preferred zone (see Map I.1). Hop producing areas of Victoria also lie within the zone but are close to its extremity; for this reason Tasmania was able to gain and maintain early dominance over Victoria when English hops were the only ones grown. By the time Californian hop varieties with slightly wider latitudinal tolerance reached Australia in the late nineteenth century, Tasmania was firmly established as the dominant colony in hop production.

Tasmania's latitude also greatly influences its climate; westerly air movements and associated cyclonic depressions dominate throughout the year (Langford, 1965). Unfortunately, the variability associated with the 'roaring forties' is such that in many growing seasons rainfall is inadequate and supplementary irrigation is necessary. The localizing effect of this factor has been substantial; initial commercial success with hops occurred in the middle-Derwent Valley primarily because of the existence of suitable conditions for irrigation. These conditions included available water in dry months, expanses of near-level and low-lying land suited to gravity-fed irrigation, and sub-surface characteristics that prevented water-logging from becoming a major problem. Coincidentally, these conditions also favoured the broad expansès of river alluvium for which the Derwent Valley hop producing areas are renowned; these soils are shown on Maps I.2 to I.4.


MAP I.1
HOP PRODUCTION LOCALITIES
40°00'
41°30'
42°00'
41°00'
42°30'
43°00'
43°30'
FLINDERS ISLAND
GEORGE TOWN
SCOTTSDALE LOCALITY
HERRICK
BRANXHOLM
LEGERWOOD
RINGAROOMA
PORT SORELL
LATROBE
LILYDALE
LAUNCESTON
ST LEONARDS
WHITE HILLS
DELORAINE
WESTBURY
LONGFORD
EVANDALE
FINGAL
EPPING FOREST
ZEEHAN
CAMPBELL TOWN
STRAHAN
OATLANDS
OUSE
HAMILTON
TRIABUNNA
MARIA ISLAND
WESTERWAY-ELLENDALE LOCALITY
PLENTY-BUSHY PARK-GLENORA CORE REGION
MAGRA
BRIGHTON
RICHMOND
SORELL
NEW NORFOLK-LACHLAN-MOLESWORTH LOCALITY
GLENORCHY
PROVIDENCE VALLEY
RANELAGH
KINGSTON
MARGATE
KOONYA
FRANKLIN
CASTLE FORBES BAY
GEEVESTON
CYGNET
BRUNY IS
N
KEY
SEE SEPARATE LOCALITY MAPS FOR DETAILS OF HOP PRODUCTION
SEE DETAILED INSETS ON NORTH-EASTERN AND SOUTHERN LOCALITY MAPS
MINOR PRODUCTION RECORDED IN VICINITY
0 25 50
KILOMETRES


MAP I.2
WESTERWAY-ELLENDALE
SOIL REGIONS
soil boundary
road
N
0 1 2
Km.
SOURCE, CSIRO, (1961)
KEY TO SOILS
soils of the river terraces, floodplains and alluvial fans
A2 SOILS OF THE LOWER TERRACES
A3 SOILS OF THE RECENT FLOODPLAINS AND ALLUVIAL FANS
soils of the mountain slopes and other low hills
YBs YELLOW-BROWN SOILS ON SOLIFLUCTION DEPOSITS
Pd PODZOLIC SOILS ON DOLERITE
Pm PODZOLIC SOILS ON MUDSTONE
Pss PODZOLIC SOILS AND PODZOLS ON SILICEOUS SANDSTONE
Bd BROWN SOILS ON DOLERITE
Blb BLACK SOILS ON BASALT
Bb BROWN SOILS ON BASALT
Blb and Bb
Jones River
ELLENDALE
FENTONBURY
WESTERWAY
Tyenna River
NATIONAL PARK


KEY TO SOILS
soils of the river terraces, flood-plains and alluvial fans
A1 SOILS OF THE HIGHER TERRACES
A2 SOILS OF THE LOWER TERRACES
A3 SOILS OF THE RECENT FLOODPLAINS AND ALLUVIAL FANS
soils of the lower mountain slopes and other low hills
Pd PODZOLIC SOILS ON DOLERITE
Pm PODZOLIC SOILS ON MUDSTONE
Pss PODZOLIC SOILS AND PODZOLS ON SILICEOUS SANDSTONE
Bfs BROWN SOILS ON FELDSPATHIC SANDSTONE
Bd BROWN SOILS ON DOLERITE
Blb BLACK SOILS ON BASALT
MAP I.3
PLENTY-BUSHY PARK-GLENORA; SOILS
soil boundary
road
railway
N
0 1 2
Km.
SOURCE C.S.I.R.O. (1961)
SOILS NOT SURVEYED
SOILS NOT SURVEYED
GLENORA
BUSHY PARK
MACQUARIE PLAINS
PLENTY
RIVER DERWENT
Tyenna River
Styx River
Plenty River
Dry Cr.
Rivulet
Allenvale
A2 with Pss


LACHLAN
Lachlan River
NEW NORFOLK
Inaccessible
Inaccessible
Dhu Rivulet
Glen
Sorell Creek
RIVER DERWENT
LYELL HIGHWAY
MOLES-WORTH
Bld
YBs
Pm
Pss
Pd
Bd
A
MAP I.4
NEW NORFOLK-LACHLAN-MOLESWORTH; SOILS
KEY TO SOILS
A SOILS OF ALLUVIAL DEPOSITS
Pss PODZOLS AND PODZOLIC SOILS ON SANDSTONE
Pm PODZOLIC SOILS ON MUDSTONE
Pd PODZOLIC SOILS ON DOLERITE
Bd BROWN SOILS ON DOLERITE
Bld BLACK SOILS ON BASALT
YBs YELLOW-BROWN SOILS ON SOLIFLUCTION DEPOSITS
ROADS
RAILWAY
SOIL BOUNDARY
SOURCE. CSIRO, (1955)
0 1 2
Km.

The establishment within the last two decades of successful hop production in the north-east of Tasmania on varied soils may well be partly as a result of the newer hop varieties being more tolerant of varied growing conditions - trial plantings of Golden Clusters, Golding and other varieties were not particularly successful in the region - but examination of soils employed for hop production in the south of the state reveals that the river alluviums seen on Maps I.2 to I.4 are not essential to successful hop cultivation. Podzolic soils on mudstone, and other soils on hillsides have been employed for cultivation of the crop and very successful hop enterprises have existed on these soils. It will be seen from the historical analysis relating to the introduction of irrigation for the crop that river floodplains were chosen at least partly because of the ease with which irrigation water could be brought to them by ditches dug from upstream. By the time pumps and other mechanical devices to raise irrigation water became available there seems to have been inertia in existing hop localities because of the existence of kilns, large hopgrounds and other capital improvements.

Burgess (1964) attempts to detail climates for a number of major hop producing regions in various parts of the world including Tasmania, but local variations to the general macro-scale pattern in Tasmania will be seen to be of greater relevance to the localizing effect that derives from climatic influences. The incidence of frosts and prevalence of strong winds, both of which cause serious damage to hops, are at least as important as broad temperature and precipitation comparisons (Davies, 1973a).

Annual rainfall and mean January temperatures for the

island are indicated on Map I.5 a-b, from which it is evident that similar general conditions as those prevailing in hop-producing localities are found also in localities such as the north-west coast which have produced very few hops. Mean July temperatures are, of course, substantially lower than January temperatures but hops are dormant in winter and are unaffected by temperatures much lower than those normally experienced anywhere in Tasmania. During the growing season however, and again in the autumn months when the crop is mature, frosts may cause serious damage. As is evident from Map I.5 c-d, the major influence on the incidence of frosts during the critical periods is distance from the coast and elevation. The Derwent Valley is marginally more frost-free than other equivalent inland areas, but again significant areas on the north coast particularly are quite frost-free during the critical periods. Details of prevailing winds over the state are not shown as recording stations are relatively widely spaced and as will be indicated in Chapter IV the effect of local topography in channelling winds and providing shelter for hopgrounds is of somewhat greater significance.

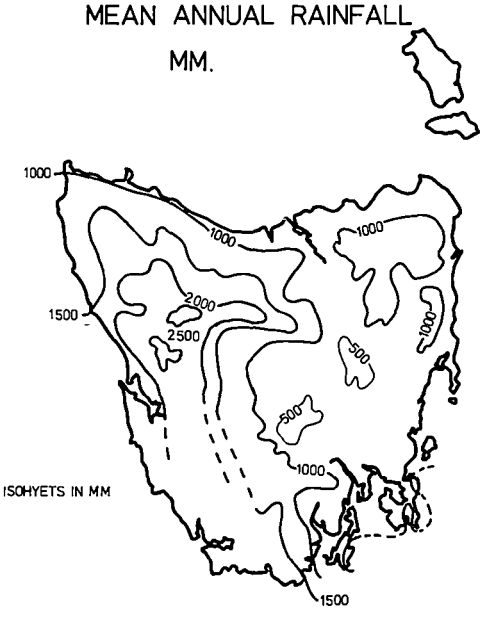
Soils undoubtedly are of considerable significance as a localizing factor in the hop industry, but their effect is by no means paramount. Myrick (c.1899), Harvey (1963) and Burgess (1964) have shown the tolerance of *Humulus lupulus* to widely varying soil types, but all agree that structural and drainage characteristics are most important. When the requirements of deep profile, good drainage and water table availability are met it clearly is further advantageous if the soil is naturally rich in available nutrients; such is the case with the floodplain alluvials of the Derwent and its tributaries the Lachlan, Styx and Tyenna rivers in Tasmania.

# MAP I.5

# TEMPERATURE AND PRECIPITATION CHARACTERISTICS

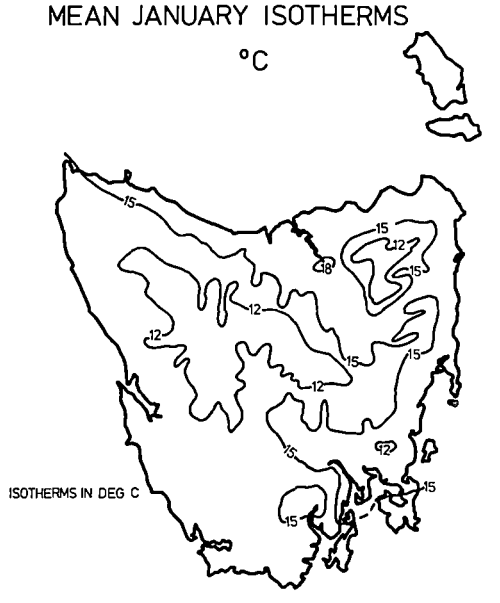
MEAN ANNUAL RAINFALL

MM.



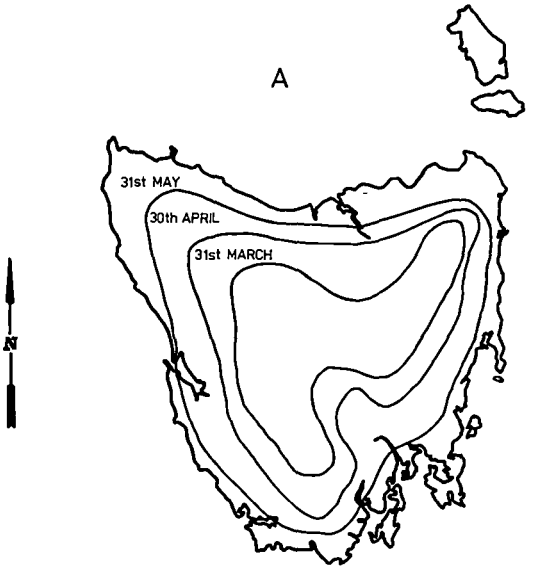

MEAN JANUARY ISOTHERMS

°C

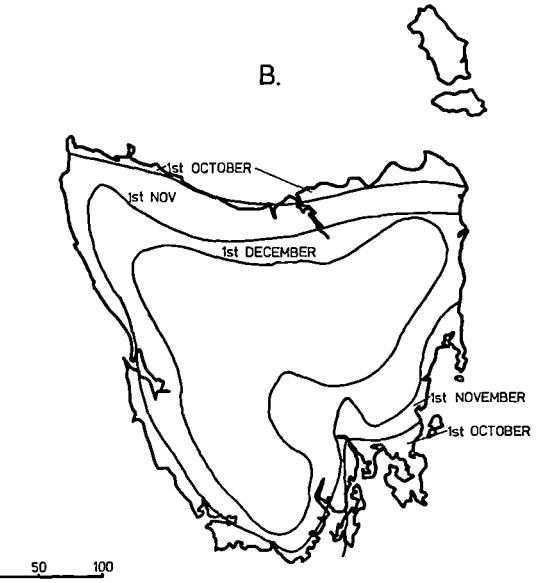



AVERAGE DATES FOR FIRST (A) AND LAST (B) OCCURRENCES OF AIR FROSTS

A




B.




0 50 100
Km

SOURCE DAVIES (1965), 3-10

Evidence that inherent soil quality is not paramount is seen in the number of farms on apparently poorer soils, particularly in the Ellendale region and in the wide range of soils employed for hop production in the Scottsdale region. Soil maps for the Derwent Valley (Maps I.2 to I.4) should be compared with the respective hop production maps for the region in question (Maps II.2 to II.4 and later maps). Although some areas in the Bushy Park region (Maps II.3, III.6, III.10 and III.11) are showing signs of soil fatigue due to continuous production of hops for over 100 years, the problem appears to be more related to structural deterioration due to constant use of heavy machinery in the fields rather than to nutrient deficiency (Ross, 1977). Similarly, in one hopground near Legerwood in the north-east of the state (Map I.1), reduced aeration of the sub-soil due to water-logging has had serious detrimental effects on the hop plants.

Relief characteristics are particularly important in hop production for a number of reasons. Micro-climatic conditions are markedly influenced by local relief. Winds are channelled along favourably oriented valleys, providing a constant threat of damage to hop plants, poles and overhead trellis systems; the 'ultimate calamity' (Davies, 1974b) to the hop grower is for his entire system of bines, poles and wires to collapse in a tangled heap. Overnight temperature inversions in frost-prone localities seem to affect adversely the production of hops on certain valley-floor farms while more elevated and sloping sites escape the frost damage. Cold air masses and temperature inversions produce ground fog in some valleys and thereby check the growth of plants; more sheltered valleys may escape both the cold air drainage from

higher ground and the fog, thereby gaining in terms of yield relative to the former regions. Information on micro-climates was obtained from individual farmers and former hop growers in the various regions, and in several cases these individuals had had experience growing hops in more than one locality; several of the more successful growers stated that they had made a conscious decision to relocate based on perceived micro-climatic advantages of their new location. Detail on micro-climatic variations however is rarely supported by available data as meteorological stations tend to be widely spaced and able to give only broad macro-scale assistance with the analysis. On the other hand, that hop producers know from their own experience the local conditions which favour one region or even one farm over adjacent regions or farms is evident from interviews with farmers. For example, three former growers and two existing producers in the Lachlan-Molesworth region indicated when interviewed that their valley escaped the inversion fogs characteristic of other parts of the Derwent region.

## The political and economic setting

In addition to physical constraints affecting production, the hop industry must be seen in terms of its specific demand characteristics; spatially in relation to the urban activity of brewing and quantitatively in terms of the virtual sole use of the plant for this purpose. The major demand for hops in Australia has always emanated from brewers in the larger metropolises of Melbourne and Sydney; Tasmania is thus at a disadvantage in terms of transport costs for the commodity; although the high

value of the crop mitigates against this being a major consideration. The market for beer, sometimes referred to as 'the barometer of the economic health of the nation' has had the blessing of governments in Australia since the first settlement in New South Wales where a viable brewing industry was seen as the only effective counter to the rum trade (H.R.A., I,1. 593). Since the colony of New South Wales incorporated Van Diemen's Land at the time, it is not surprising that the earliest hop plantings were carried out in the island by the government; government plantations run by convicts at Maria Island and Port Arthur remained in production until 1846-47 (Inward Despatches, G.O. 1/68), (see Map I.1).

Government encouragement of beer production and consumption has continued in Australia, particularly since Federation in 1901 (see Figure V.1) undoubtedly at least partly because of the large financial returns to the Federal Government from beer excise. All state governments in Australia have gained from liquor licenses and associated revenues where the majority of income production is from sales of beer. A contributing factor in the development of the Australian thirst for the 'amber liquid' had undoubtedly been the hot climate of much of the country but world patterns of beer consumption show little relationship to climate; Czechoslovakia and West Germany are notably high on the list of per capita consumption.

The major economic constraint within which the hop industry in Australia has operated is that the Australian market is still by world standards a small one, and as this has provided the main outlet for hop producers the total crop has constituted

only about 1% of world production (Pearce, 1976). Of this, Tasmania has variously produced from well over 80% at the turn of the century to about 62% in 1976-77 crop year (A.B.S., 1978). The figure may well be much lower for 1978 (1977-78 crop year) due to wind damage in Tasmania in that year.

A constitutional constraint to the orderly marketing of hops in Australia derives from Section 92 of the Commonwealth Constitution. Specifically, produce going into interstate trade is expressly excluded from compulsory domestic marketing arrangements and as most of Tasmania's hops move to interstate breweries the industry has lacked the capacity for self-regulation. Long-term cycles of over-production and consequent contraction of the extensive margins of production are therefore much more prevalent than might otherwise be the case. Further causes of oversupply of the market derive from the move towards higher-yielding hops with payment by weight of hops rather than alpha acid content giving undue advantage to the brewer at the expense of the hop producer. Growers have tended to maintain production levels despite declining demand in order to try to maintain income; the beneficiary has invariably been only the brewer. In turn, the brewers have progressively reduced the amount of hop lupulin or alpha acids required for brewing. Both trends tend to be countered by some increase in beer consumption, but the current period of oversupply reflects the failure of the industry to cope adequately with these problems. The spatial impact of these circumstances has been considerable, particularly in the last decade or so when mechanization of production has led to a tremendous change in the economies of scale for hop production.

The survey method and data

Chapter II of this study is concerned essentially with the historical geography of the hop industry while Chapters III and IV may be regarded as the analysis of the contemporary period. The choice of 1960 as the divide is to some extent arbitrary as the early development of the industry in the south of the state is partially reflected in the continued existence of the greater proportion of the industry remaining in the Derwent Valley in 1978. However, the period since 1960 contrasts markedly with the earlier period in that it has been a period of extremely rapid and substantial structural transformation, particularly with regard to relative changes in the importance of the various factors of production, and with regard to the relocation of a significant portion of the industry. A further temporal sub-division occurs in Chapter III but this is essentially a separation of the spatial response currently typifying a period of uncertainty and consolidation within the industry from the growth and expansion which may be expected to characterise more prosperous periods. The separation of the study around 1960 is not entirely rigid either, as certain data used as the basis of the quantitative analysis of the industry in Chapters III and IV are available from the early 1950's and are analysed at appropriate places in Chapter II and Chapter IV.

Chapters II and III are essentially macro-scale studies of the industry, although micro-regional analysis of grower numbers and farm size distribution is undertaken in both chapters. The specific concerns of Chapter IV are with the detailed micro-regional variations in physical characteristics

and behavioural attributes of farmers that have variously given rise to differences between micro-regions. Hop factoring, marketing, and external economic changes that have dramatically influenced the contemporary distribution of production also form part of both Chapter III and Chapter IV.

The historical analysis of hop production is essential to the wider purpose of the study which is to try to elucidate some general principles of agricultural land-use as they apply to highly-localized, high-cost industrial crops. It therefore has much in common with the methods used by Leaman and Conkling (1975) in their study of 'transport change and agricultural specialization' and with the approach of Turner (1972) in his study of 'flax cultivation in Scotland'. Both these studies attempt to derive general principles from one period of study which have application to the contemporary task of developing process laws for eventual agricultural land-use theory construction. In contrast, other studies of historical geography constitute reconstructions of past geographies as in the study by Kelly (1971) of 'wheat farming in Simcoe County in the mid-nineteenth century', or 'cross-sectional' approaches or 'generic' approaches as detailed by Baker (1972).

It is no mere coincidence that there has been a number of studies in the historical geography of the hop industry, particularly in Britain and North America (Landis, 1939; Pocock, 1959; Harvey, 1963). The distinctive landscape generated by hopgrounds, kilns and associated features is termed a "hop country" in Britain (Pocock, 1959) and is inevitably attractive to geographers for this reason. Part of the "hop country" of

Tasmania is illustrated in Plate I.1. The author's field surveys in Tasmania have been greatly assisted by relic features of former hop grounds such as lines of Italian poplars which were used for wind breaks, hop poles remaining in disused ground, old kilns and other evidence of former production in those areas which no longer have the characteristic "hop country" appearance.

The approach employed by Pocock (1959) is a macro-scale study of the industry in Britain in which regional change and general decline of planted area is examined by way of a cross-sectional examination of detailed parish data in selected years. Harvey's (1963) study of the industry in Kent also draws upon parish data, but because of the smaller area involved is able to make a much more quantitative use of the available statistics. The latter study demonstrates the application of a gravity model to validate the hypothesis that once a core area of hop production emerged, the key variable affecting the location of production was distance from this core area. Harvey was also able to relate periods of economic prosperity and decline within the industry to comparable expansion beyond, and concentration toward the core area.

Scale differences between the Kentish hop industry and that of Tasmania are such that the methods employed by Harvey (1963) are not practicable in Tasmania. In addition, data are collected mainly according to municipalities in Tasmania and the size and arrangement of these collection units prohibits any worth-while analysis of the distance variable such as that employed by Harvey. In the absence of the detailed data of the type possessed by Harvey, (1963) much of the historical analysis

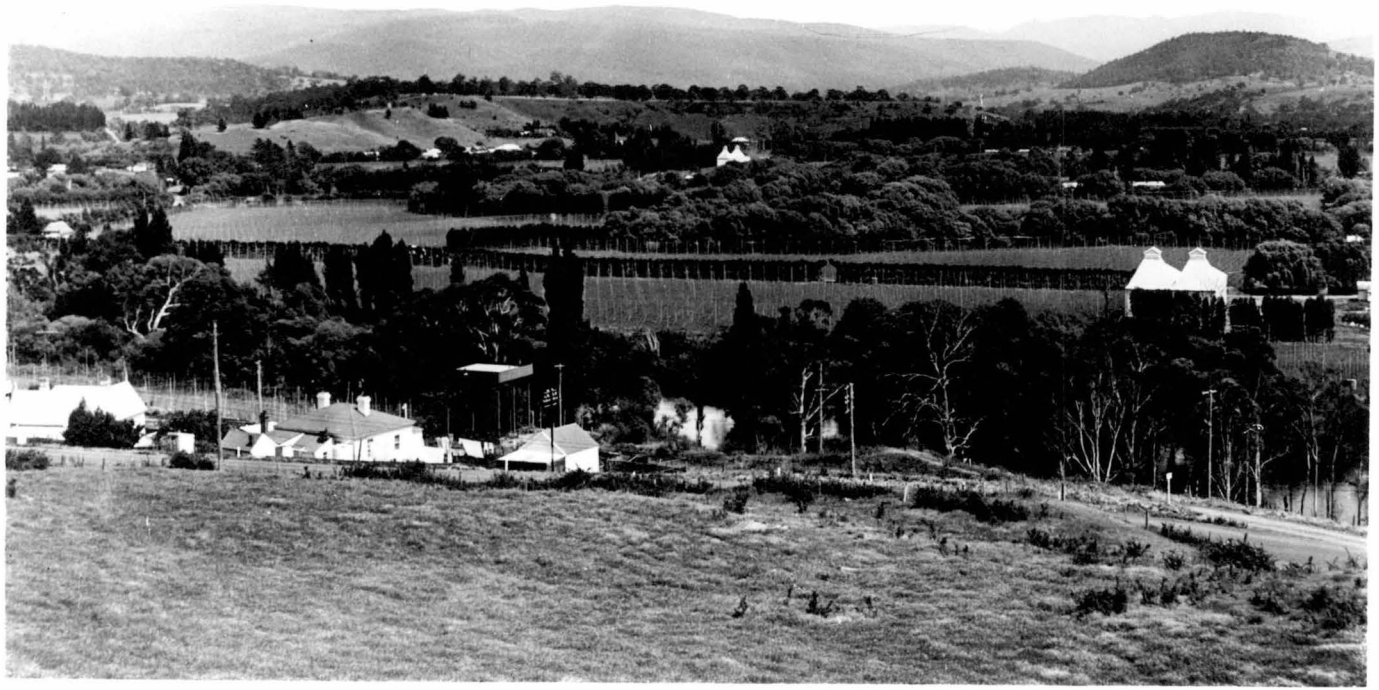


Plate I.1
The "hop country" of the Macquarie Plains area.

Reproduced with permission of
Tasmania Media Centre.

of the hop industry in Tasmania is necessarily descriptive, but as much in the present can only be explained by reference to the past - and this is certainly true of the hop industry in Tasmania - the case argued by Harris (1971) for 'theory and synthesis in historical geography' must be seen as validation for a somewhat more traditional geographic approach.

In the case of Tasmania, broad data pertaining to area under hops, gross production and yield are in published form in the various government statistical records as are break-downs of the distribution of these variables by municipality. Other published data include the value of production in Tasmania and Australia as well as details of interstate and overseas exports, and more recently, certain information as to varieties of hops produced and yield information according to the number of hills of hops.

As with many published statistics pertaining to agriculture however, much is disguised within the data, and much has not been recorded in a sufficiently detailed manner; for example, the entrepreneurial structure of the industry has been ignored by the statisticians as pointed out by Scott (1961a). Examples of the disguising effect of the broad data relate to the various methods of stringing hops which have certain effects on yields and labour costs. Thus, apparent variations in yield from one region to another may reflect variations in cultivation intensity rather than significant differences in growing conditions. The same point may be made with respect to the planting arrangement which affects the number of hills to the hectare, and thereby the yield. For the purpose of this study however, it must be assumed that the amount of such variations will not be

substantially different from one region to another, and to a certain extent this is supported by detailed interviews with growers in different localities. Despite the foregoing, certain regional variants such as differences in varieties of hops grown will be commented upon as appropriate.

Statistical analysis of production data for the regions delimited will therefore form a major part of the attempt to explain the periodic expansion and contraction which has characterised the industry. An essential consideration in the statistical analysis will be the attempt to relate periods of expansion and contraction within the industry to fluctuations in prevailing economic conditions for hop production, and to attempt to show, where applicable, the subtle economic impact of apparently minor micro-climatic variations and the consequent effects of a spatial nature that such influences may have when producers in different localities are forced to compete for survival. Appropriate statistical techniques will be employed in the analysis of data, the most common being the various measures of central tendency for purposes of inter-regional comparisons. These include mean, ($\bar{X}$), standard deviation, ($\sigma$), median and mode. Pearson Product Moment Correlation Coefficients and regression coefficients will be employed where data are normally distributed and where relationship between variables is suspected. Essential data will be included in the appendix, and where appropriate, relationships will be illustrated diagramatically.

Air-photo analysis of all hop-growing regions in Tasmania has been undertaken in order to detail the precise location of all hop production in recent decades, although the

coverage varies in time to some extent between regions. The earliest coverage for the Derwent Valley is for the crop year 1945-46 with no subsequent coverage until 1965-66. More recent coverage exists for 1974-75 except for the Westerway-Ellendale region which was photographed in the 1971-72 crop year. Coverage for the north-east of the state is partly for the 1974-75 crop year and partly for the 1976-77 crop year; however the total changes in planted area since 1974-75 for the region have not been significant (Davey, 1977). Coverage for the Kingston, Margate and Ranelagh localities is as indicated on the relevant maps.

Present growers, as well as a number of former hop producers were surveyed by questionnaire or detailed personal interview to obtain records of planted area and production. The former growers from whom detailed information was obtained numbered 18, and all but three of the 20 private growers in 1977 were interviewed; certain details were obtained with the permission of remaining growers in the industry, and details pertaining to the one large company remaining in production were obtained from present employees both on-farm and in other capacities such as the marketing area. Details sought from growers and former growers included: hopground area in particular time periods; number of hills of hops; hop varieties; methods of cultivation; technology and extent of mechanization; farm diversification; yield details; selling agency; and a number of general behavioural questions such as source of industry information most frequently used was asked. Boundaries of hopgrounds were confirmed from air photographs by field inspection, and during this process the majority of the former hop producers was located; invaluable assistance was given by growers and former growers where detail on the photographs was unclear, and in the case of the large properties farmers supplied maps indicating

field boundaries. As with smaller hop farms, however, total area or farm boundary detail was less meaningful than was the area of the 'economic unit' devoted to hops, other arable activities and livestock, as many farms include large areas of land not used for production; areas of swamp, steep-sided hills, gullies and thickly vegetated slopes distort the relationship between farm structures in different regions. Hopground area was found to be a more valid basis of comparison for most purposes, and farm sizes have been described accordingly.

The questionnaire (Appendix III) was returned by 14 former growers and six private growers in the south; in all of the latter cases there were also detailed interviews on more than one occasion each. Several of the questions on the questionnaire were not appropriate for growers in the north-east who had established under different circumstances; these growers were therefore interviewed in detail as well. Of the 20 questionnaires returned, 17 contained records of production for various time periods, and 15 of these were utilized in the yield analyses for micro-regions as the data were confirmed from hop factor records.

As has already been mentioned, published statistics based on grower returns must be treated with some caution. In some years, notably the early 1940's, when many smaller growers - especially in the Ellendale area - did not possess their own drying kilns their crop returns indicated only production by green weight and these figures have been incorporated into the dry weight municipal total without modification; regional totals were used by the C.B.C.S. in this form in compiling the state gross production and yield figures, thereby considerably over-stating both gross production and yield. A survey of all but three of the

growers remaining in 1977 was carried out in that year. Further extensive interviews with some growers took place in 1978. In addition, personal interviews were conducted with 18 former growers in 1977 and although considerable difficulty was experienced with a detailed questionnaire due to lack of grower records, accurate production records were obtained from 12 former growers. The interview sample represents 48% of all growers in the 1973-74 crop year before the rapid decline in grower numbers, and 85% of growers in the 1977-78 crop year. Details of remaining growers have been supplied with their permission through other sources so that crop area details are complete for 1977-78.

A second source of detailed grower information was confined to those growers who sold hops through the leading hop factor, H. Jones and Co. between 1952 and 1966. To this extent, the sample may not be fully representative but it was drawn from every hop producing area in approximate proportion to total producer numbers. Records of sales of hops for these growers through the various factor-owned kilns or directly as dried hops, were available.

Farm structure information in terms of the area devoted to hops, other cash crops and livestock activities was obtained from the state Lands Department valuation records for 1952 and subsequent valuation years. This information applied only to farms in the south of the state as broad information of this type had already been obtained from growers in the north-east of the state by personal interview. A valuable aspect of these records was the fact that planted area in hops was recorded as "hop acres" of 1200 hills which greatly facilitated calculation of

accurate yield figures for the eventual detailed sample selected from the combination of the factor records and valuation records. For this purpose, the need was to identify farms which had not altered their hopground size over time or where the date of such alteration was known, and for which the production record was either complete or sufficiently complete for inclusion in part of the analysis. (Not all growers who sold through H.Jones and Co. did so in each year). An eventual sample of 19 farms was selected for purposes of analysing possible micro-regional differences within the Derwent Valley. Fifteen of these farms were cross-checked with grower records obtained by the questionnaire survey or from records of present producers.

Themes

It has not been possible to formulate and test hypotheses in a rigorous scientific sense due to the fragmentary nature of much of the available data. However, the recurrence of general patterns, both of an economic nature and in the spatial context, allows for the development of evidence which may be regarded as at least partial support for three major themes around which the study is developed. The term 'themes' is used to indicate the essential foci of the study.

Minor themes, particularly those relating to behavioural inputs of farmers, are not subject to detailed analysis as the available data are inadequate. However, the contribution of these themes appears at times to be substantial and attempts are made to incorporate them where relevant.

The wider themes derive from a combination of two economic

considerations which are paramount from the point of view of hop production; the high-cost structure of the productive enterprise and the limited nature of the end-use for the product. On the one hand, prices must be high enough to provide a reasonable return on investment, and on the other hand very high prices are likely to attract more producers and thus lead to over-supply of the market.

Related to the point on cost-structure is the importance of yield variations which are to a large extent independent of factor inputs. This has led to a major regional shift of production as growers in the north-east of the state discovered the suitability of their region for the crop. In contrast, traditional marketing arrangements and related influences such as capital availability have tended to perpetuate a concentration of southern production towards a dominant or 'core' region. There have thus been both centripetal and centrifugal forces operating to affect the spatial distribution of hop production in Tasmania. The dominance of the one over the other has varied according to the prevailing economic conditions within the industry. These in turn have been subject to certain cyclical reversals.

The specific themes which will be seen to be central to the thesis are as follows:

1) that there is a relationship between prevailing price levels for hops and the expansion or contraction of the extensive margins of production for the crop; expansion occurs when prices are high and long-term markets assured; contraction when uncertainty as to either arises;

2) that micro-regional variations in the capacity of growers to survive are evident and appear to be related to both the physical environment and the distance of the production locality from the core production region, and

3) with a relative decline in total demand for hops in recent decades, only those growers who have been able to take advantage of modern technology to make maximum use of available factor substitution and to derive the advantages of scale economies have been able to survive; surviving enterprises in 1978 are therefore much larger in terms of hopground size, and structurally different from enterprises which were typical of the industry in 1960.

# CHAPTER II

## THE TASMANIAN HOP INDUSTRY TO 1960

### Introduction

The first 150 years of hop production in Tasmania parallels the transformation of the island from a "primitive antipodean colony ... to a complex capitalist economy" (Hartwell, 1954, 4). Individual hop growers succeeded in the new environment by coming to understand its physical and economic peculiarities; the spatial distribution of hop production however, has rarely been static for long; fairly regular spatial adjustment in response to cycles of increasing and decreasing demand have been characteristic throughout the entire 175-year history of the industry.

Only by tracing the major expansions and contractions in the productive cycles is it possible to account adequately for the spatial arrangement of the industry in the contemporary period. More significantly, present entrepreneurial structure and attitudes of farmers can only be comprehended in the light of individual experience and traditional attitudes that have pervaded the industry.

In a reasonably restricted sense, 1960 can be seen as the end of one entrepreneurial phase and the beginning of another; the end of the phase of the small family farmer who relied principally on family labour and seasonal workers, and the beginning of the mechanized age where agri-business, co-operatives and vastly increased scale of enterprises are the order of the day. Yet patterns of production established over 100 years ago remain to some extent in 1978; all farmers must still contend with fundamental

physical and economic realities that confronted their forebears. It is clear from examination of historical evidence that hop growers have at all times been involved in a high-cost enterprise in relation to unit area of land, where knowledge of as many of the variables as possible and correct decisions made the difference between survival and failure; there has been no room for the consciously sub-optimal entrepreneur.

The first two sections of the chapter parallel expansionary cycles and end respectively at the time of the collapse of such cycles in the 1880's and the 1930's. The third section concludes before the expansionary phase again reaches its height because of the convergence of several significant changes; the prosperity of the industry in the 1950's led to the emergence of hop production in the north-east of the state, and both factors hastened the technological revolution that transformed the industry by the late 1960's. These events must be examined in detail before the collapse of the early 1970's can be fully understood, and they are therefore taken up in the subsequent chapter. The choice of 1960 as the end of the historical chapter coincides with the emergence of the industry in the north-east, but 1968 saw the maximum extent of grower numbers in the state and maximum extent of planted area occurred several years later (A.B.S., 1974).

## The initial establishment period to 1885

The first 60 to 80 years of hop cultivation in Tasmania involved processes of trial and error, of learning about a new environment and of actively searching for localities possessing the most suitable growing environments for hops. Only through

examining these processes in detail can the regional distribution and structural character of the industry in the present period be adequately comprehended.

The immediate stimulus to hop production at the time of the initial settlements in Van Diemen's Land was undoubtedly the shortage of the commodity in Sydney (H.R.A. I, iv, 37). By 1803 there were still no viable hop grounds in New South Wales, the main problem to that time being the difficulty of transporting live hop sets from England; those plants grown from seed lacking the desired characteristics of selectively bred English hops (H.R.A. I, iv, 79). Successive letters from Governor King to the government in England requested both live hop sets and dried hops (H.R.A. I, iv, 392; H.R.N.S.W. v, 220); the main need being to provide a more desirable beverage than rum in order to counter the trade in the 'evil spirit'.

It is not clear when the first English hop sets were successfully brought to Van Diemen's Land but Colonel Paterson may be credited with the first attempt to grow hops from seed, or more likely from cuttings taken from his own seeded plants in his garden in Sydney (Sydney Gazette, 23 Dec., 1804), when he founded the settlement at Port Dalrymple (Launceston) in 1804 (H.R.A. III, i, 608). Earlier comments on the suitability of the island for cultivation had been made by Bligh (see Hill, 1941) and Flinders (Mackaness, 1946). Other settlers grew hops from seed probably as early as 1806 (Inward Despatches, L.S.D. 1/92, T.A.) in the Clarence Plains area in the south of the island; a Richard Clark was granted 190 acres for hop production by Governor King in 1806 (H.R.A. III, i, 568). However, a decade or so passed

before the very favourable climate of Van Diemen's Land for the brewing of beer was recognized and farmers were urged to cater for the increasing demand for hops by cultivating the crop "in situations sheltered from the sea-breeze and in-land gusts of wind" (Hobart Town Gazette, 11 May, 1816). The use of rum for currency was banned in 1815 and the market for hops expanded in subsequent years as the excellence of beer brewed in both Sydney and Tasmania was appreciated. In 1825, the year that Tasmania became a separate colony, Governor Arthur offered 200 acres of land for three successive years to the individual who "should cultivate the most considerable quantities of hops" (Hobart Town Gazette 4 Feb. 1826). Continued government encouragement of hop producers and brewers undoubtedly provided the incentive needed for early plantings of hops in many localities. In 1824 there were three breweries in the island, and the number increased to 11 by 1830 and 22 by 1840 (Statistics of Tas. 1804-1854). As Bethell (1958) points out, the expansion of hop production was almost inevitable during the period.

In 1822 William Shoobridge arrived in Hobart, having carefully tended his hop plants on the voyage from England. These may have been the first live plants to reach the colonies; it is certainly clear that Shoobridge was intent on becoming a successful hop producer. There was reasonable expectation from the latitude and general similarity of climate to that of Kent, Shoobridge's place of origin, that a thriving hop industry could be established in Tasmania.

Burgess (1964) has compared temperature and rainfall characteristics of major hop producing areas including Tasmania

(see Tables II.1 and II.2). It is evident that the data for Tasmania used by Burgess are closely aligned to New Norfolk and Bushy Park means, but the variation of temperature and rainfall characteristics over hop growing localities in Tasmania is considerable. More importantly is the variability from season to season for any given locality, as Shoobridge was to learn to his cost at Providence Valley. Tasmania's climatic variability will be elaborated in some detail in the section dealing with micro-regional characteristics in Chapter IV.

Shoobridge seems to have assessed the general physical characteristics of Tasmania as suitable for hop production, and had applied for and been granted land "in accordance with the means (he possessed) ... to bring it into cultivation" (Shoobridge records). Indication of the appeal that hop production in Tasmania had for others in England is gained from a letter sent to Earl Bathurst in 1819 from a T. Richardson:

> "and having for many years had a considerable plantation of Hops on my own estate in the county of Sussex, kept up and managed in the highest state of perfection by my own particular attention, should your Lordship be pleased to consider that the growth of hops would be of great utility on the Island, I trust I should be able to raise a plantation of that valuable Article in a short time." (H.R.A. III, ii. 700).

That an apparently established hop producer would contemplate a move to the as-yet-untried Van Diemen's Land is evidence of the challenge that men of experience saw in the island. Little is known of Shoobridge's background in Kent but it is well recognized by growers to the present time that he and

TABLE II.1

AVERAGE MEAN TEMPERATURES ($^{o}$C) OF HOP-GROWING DISTRICTS

| | April | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|
| ENGLAND | | | | | | |
| South-East | 8.7 | 11.3 | 14.4 | 16.5 | 16.2 | 13.8 |
| West Midlands | 8.1 | 11.6 | 14.3 | 16.4 | 16.0 | 13.5 |
| U.S.A. | | | | | | |
| Sacramento, California | 14.8 | 17.7 | 21.5 | 24.1 | 23.4 | 21.2 |
| Willamette, Oregon | 10.2 | 13.3 | 16.1 | 19.1 | 18.9 | 16.1 |
| Yakima, Washington | 11.6 | 15.5 | 19.2 | 22.9 | 21.7 | 16.9 |
| Puvallup, Washington | 10.1 | 12.8 | 15.5 | 17.8 | 17.6 | 14.9 |
| CANADA | | | | | | |
| Lower Fraser Valley, British Columbia | 9.4 | 13.3 | 15.6 | 17.8 | 17.2 | 15.0 |
| GERMANY | | | | | | |
| Hallertau, Bavaria | - | 11.6 | 14.9 | 16.6 | 15.9 | - |
| FRANCE | | | | | | |
| Strasbourg, Alsace | 9.8 | 14.3 | 17.4 | 19.0 | 18.3 | 15.0 |
| Dijon, Burgundy | 10.3 | 14.5 | 17.6 | 19.6 | 19.0 | 16.1 |
| AUSTRALIA | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. |
| Tasmania | 10.1 | 12.1 | 14.6 | 16.1 | 16.3 | 16.8 |

Source: After Burgess, (1964).

TABLE II.2

AVERAGE RAINFALL (MM) OF HOP-GROWING DISTRICTS

| | April | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|
| ENGLAND | | | | | | |
| South-East | 42.5 | 43.0 | 50.75 | 55.0 | 59.5 | 54.25 |
| West Midlands | 42.75 | 53.25 | 56.0 | 55.25 | 68.0 | 46.25 |
| U.S.A. | | | | | | |
| Sacramento, California | 36.0 | 24.25 | 4.75 | 0.5 | 0.25 | 8.75 |
| Willamette, Oregon | 74.0 | 58.0 | 36.25 | 12.5 | 13.75 | 49.5 |
| Yakima, Washington | 10.25 | 11.5 | 12.5 | 5.0 | 5.5 | 10.25 |
| Puvallup, Washington | 62.5 | 50.25 | 37.5 | 17.75 | 19.0 | 44.25 |
| CANADA | | | | | | |
| Lower Fraser Valley, British Columbia | 99.25 | 94.25 | 79.5 | 43.25 | 48.75 | 102.5 |
| GERMANY | | | | | | |
| Hallertau, Bavaria | - | 88.5 | 96.5 | 110.25 | 96.5 | |
| FRANCE | | | | | | |
| Strasbourg, Alsace | 51.75 | 62.5 | 66.25 | 86.75 | 74.0 | 66.25 |
| Dijon, Burgundy | 46.75 | 55.5 | 72.25 | 58.5 | 61.5 | 54.5 |
| AUSTRALIA | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. |
| Tasmania | 51.75 | 57.5 | 54.25 | 53.25 | 45.25 | 34.0 |

Source: After Burgess, (1964).

his sons must be seen as the main source or initiators of the diffusion of information that necessarily accompanied the decades of searching for the most favoured locality for hop production. This diffusion process is particularly important in the case of a crop having such high establishment and operating costs and will be seen to operate not only in this early period of the industry but again in the recent period of development in the Scottsdale area in the north-east of Tasmania.

Shoobridge's choice of Providence Valley, about one mile from the centre of Hobart Town for his first hop ground is interesting because it was not particularly excellent soil nor was it river flood-plain. Hops grow on a wide variety of soils in Kent (Myrick, 1899?; Pocock, 1959; Harvey, 1963), and they grow on hillsides as often as on flat land (Farquhar, 1977), so Shoobridge could not be expected to know that it was to be different in Tasmania.

The Providence Valley experiment failed because of the long-run frequency of summer drought which is high in Hobart as in most of Tasmania. Interestingly, irrigation was not immediately perceived as the answer and hop production had already started around New Norfolk in recognition of the excellent soils of the river terraces in the area before the advent of irrigation in the 1840's. Scott, (1961a, 237) describes the hop growing soils of the Derwent Valley as "alluvial soils of high fertility, level surface, deep profile, and high water table; they are heavily fertilized and almost invariably irrigated". The question of whether the flood-plain soils of the Derwent possessed such advantages that in the long term there would have arisen here

the major hop producing region of Australia without the added advantage of irrigation water is a difficult one to resolve satisfactorily. The simple extent of the irrigable flood-plain along the Styx River at Bushy Park must be weighed against the actual advantages of the soil itself. Undoubtedly, soil type and level terrain were major attractions for the area.

The soils of particular interest for hop production are the soils of the river terraces, floodplains and alluvial fans as detailed by Dimmock (1961) in the Bushy Park to Ellendale portion of the Derwent and Loveday (1955) in most of the remaining hop producing areas of the Derwent and southern region. The 1961 report of the C.S.I.R.O. differentiates between the various alluvial soils for the Bushy Park - Ellendale areas, and detailed comparison of Maps I.2 to I.4 with the respective hop production maps (II.2 to II.4) reveals a marked association between areas of hop production and the A3-type soils of the flood-plains and alluvial fans, the only notable exceptions being in the hill country around Fentonbury and Ellendale. It is quite apparent from the location of the earliest hop gardens around New Norfolk and Bushy Park that the "typically dark brown deep friable profiles with excellent structure" (Dimmock, 1961, 14) of the Derwent series soils had considerable attraction for hop producers from the points of view of ease of working and fertility. Clark (1970) has shown that the effective depth from which hops can draw soil moisture is 180 centimetres so that both the drainage characteristics and available water table of these soils had undoubted attraction for hop producers. However, as will be indicated in Chapter IV, those localities which produced the highest effective yields of hops were in fact some of the smaller

tributary valleys, and some of these yields were obtained from soils of the second sub-division of the A3-type, notably black granular clays.

The apparent association of hop production and soil type is more fully explained when the elevation of the floodplains and river terraces is considered. Dimmock (1961, 7) states of the Derwent Valley area that "most of the country is hilly or mountainous, the limited areas of flat land being confined to relatively narrow strips along the river valleys". The soils of the river terraces, floodplains and alluvial fans constitute the main areas of relatively flat land. The 100-metre contour interval shown on the respective hop production maps for the area (see later sections) allows only a broad, general interpretation of relief characteristics, but the range of elevation given by Dimmock for the A-type soils of the region assists further. A1 soils are soils of the higher terraces ranging in height from about 75 metres to 125 metres or more above present stream level. Soils of the lower terraces, A2-type soils, range from about 18 to 36 metres above the present river level, and the A3-type soils of the floodplains and alluvial fans lie at about 3 metres above river level. It is the latter soil type which is both structurally suited to hop production and also readily irrigated by flood irrigation techniques. Its attraction for early settlers wishing to begin hop production as well as its suitability for hops since that time must therefore be seen as more than a function of soil fertility, level surface and structural characteristics. Irrigation was possible here as it was not at higher elevations, and natural shelter in the valley bottoms was better than in more exposed localities at higher elevation.

In the various accounts of soil conditions in Kent, (Myrick, 1899?; Pocock, 1959, and 1960; Harvey, 1963,) it is clear that apart from certain soils that are ideally suited to hop cultivation and some which are negative due to drainage problems, "most of the soils throughout the district were neither absolutely negative to hop cultivation, nor particularly favourable", (Harvey, 1963, 127). Harvey demonstrates that the key variable is economic conditions and that given the right economic climate most soils of the district could be used for hop production. In the case of Tasmanian hop production this view seems to be supported by the periodic expansion of hop production into tributary valleys of the Derwent and beyond the Derwent to other parts of the state in times of prosperity within the industry, and subsequent contractions of the industry towards dominant or 'core' areas of production, especially the middle Derwent region when conditions have been less favourable. Davies (1973a) suggests early association of hop production with local breweries throughout the island but the early dominance of the Derwent Valley is difficult to support in this light, and the major market was always an export one. Smokeless coal, used in drying of the hops, was obtained from Kaoota, south of Hobart (Davies, 1973b) but only small quantities were needed for hop kilns and its influence as a locational factor was probably minimal.

Examination of the specific economic conditions prevailing within the hop industry in the mid-nineteenth century is only possible in a fairly general sense, but much of the process of early spatial adjustment, adaptation, expansion and contraction deriving from prevailing economic conditions can only be

understood in the light of such analysis. The cost structure for establishment and operation of hopgrounds seems to have been similar in Tasmania to that of Kent in the mid-century as shown by Whiting, (1868), (see Table II.3). However, costs were variable between growers as Pearce (1976) shows, for much depended upon whether a grower had stands of timber from which he could cut his own hop poles, on whether he used his own or another grower's kiln for drying his crop, on whether he had sons or other family members as unpaid labour and on other variables through which costs savings could be made. More significant than absolute costs of production for the period are comparisons with other types of farming. Harvey, (1963), states that in mid-century the cost of land in Kent suitable for hop cultivation was anything between £60 and £100 per acre and the annual costs of cultivation were between £25 and £40 per acre. In an example taken between 1838 and 1846 an annual expenditure of £35 per acre on hop land compared with £5-12s on the other arable.

Statistics on the cost of hop land as distinct from other arable land are not readily available for Tasmania, but an indication of its cost may be gained from its rental value of £4 per acre (Table II.3) which puts it well above the purchase price for other arable land prevailing in the decade from 1876 to 1885. In this period, land sold as agricultural land cost from £1.2.1. to £1.11.7 an acre (Gov. Stat., 1885). Pastoral land sold for 15s/5d to £1.9.1 an acre. Assuming a purchase price of £1 an acre for 50 acres (20 hectares) of non-hop land and costs as shown by Whiting for 2 hectares of hops (5 acres) before returns could be expected, a farmer would be looking at a capital investment of well over £300 by the time a dwelling and other improvements were added. If the £4 an acre rental cost is taken to indicate a possible purchase

price for the best hop land of £30 per acre (possibly too low), the cost of land alone for this farm becomes £200. Operating costs for the hopground add about £160 before returns could be expected, and dwelling, kiln and other improvements still need to be considered. The likely cost-range for a 5-acre hop farm thus becomes £250 to £450 at this time. Given the average cost of arable land for the period, the same farmer could clear and cultivate perhaps 100 acres in other crops for the same capital outlay. Farm sizes at the time were rarely larger; the majority were considerably below 100 acres in extent. In 1885, for example, the number of rural properties sold in Tasmania was 631, with a mean size of 83.7 acres and a median size of less than 50 acres. These properties include those used for pastoral activities. Lands granted in 1885 consisted of 60 properties averaging 51 acres, and only 168 properties sold or granted exceeded 100 acres. Thus it is likely that only the extensive grazing properties would have exceeded, in capital investment, the investment required for profitable hop cultivation on even the small family-operated scale.

Hop production could therefore only be undertaken by those with capital resources, and at least until information on the methods of cultivation was freely available the industry required men of experience. Leading growers were therefore to play a very important role in the diffusion of both information and hop sets, the result of which was to favour nearby localities over more distant ones. In turn, when leading growers relocated, as they did in the early years of the industry, so too did the centre of gravity for the industry as a whole.

In 1854, published statistics showed a mere 22.27 hectares planted to hops, (see Table II.4). At this time,

TABLE II.3
ENGLISH AND TASMANIAN COSTS OF PRODUCTION PER ACRE IN 1868

| | Mid-Kent | | | | Tasmania | | | |
|---|---|---|---|---|---|---|---|---|
| | £ | s | d | % | £ | s | d | % |
| Rent of land | 2 | 0 | 0 | 6.7 | 4 | 0 | 0 | 12.9 |
| Manure | 7 | 0 | 0 | 23.3 | 5 | 0 | 0 | 16.1 |
| Digging | 1 | 0 | 0 | 3.3 | 2 | 10 | 0 | 8.0 |
| Laying out poles | | 1 | 6 | .27 | | 7 | 0 | 1.1 |
| Dressing | | 6 | 0 | 1.0 | | 16 | 0 | 2.6 |
| Poling | | 15 | 0 | 2.5 | 1 | 5 | 6 | 4.1 |
| Tying and ladder tying | | 11 | 0 | 1.8 | 2 | 10 | 0 | 8.0 |
| Horse hoeing, four times | 1 | 4 | 0 | 4.0 | 1 | 5 | 6 | 4.1 |
| Hand hoeing | | 5 | 0 | .9 | | 7 | 0 | 1.1 |
| Forking round hills and earthing | | 9 | 0 | 1.5 | | 15 | 0 | 2.4 |
| New poles | 7 | 0 | 0 | 23.3 | 3 | 0 | 0 | 9.7 |
| Putting up blown down poles* | | 5 | 0 | 0.9 | | 8 | 0 | 1.3 |
| Stacking poles, binding bines* | | 5 | 0 | 0.9 | | 8 | 0 | 1.3 |
| Taxes, rent, insurance, repairs to kiln etc.* | 4 | 16 | 0 | 16.0 | 1 | 0 | 0 | 3.2 |
| Interest on all money sunk (5% in England, 8% in Tasmania)* | 4 | 4 | 0 | 14.0 | 6 | 10 | 0 | 20.9 |
| Irrigation* | | - | | - | 1 | 0 | 0 | 3.2 |
| Total cost of cultivation | 30 | 1 | 6 | 100.0 | 31 | 2 | 0 | 100.0 |
| Picking, drying, marketing (assuming 6 cwt. yield) | | | | | 12 | 0 | 0 | |

* Estimates only

Source: Tasmanian Times, 22 July, 1868. The English production was estimated at one ton an acre, the Tasmanian at 15 cwt. an acre - both much above the average growth for England and Tasmania as Pearce (1976) also indicates.

TABLE II. 4

AREA PLANTED TO HOPS IN TASMANIA 1854-1886

| Year | Planted Area (Hectares) | Year | Planted Area (Hectares) |
|---|---|---|---|
| 1854 | 22.27 | 1876 | 268 |
| 1866 | 58 | 1878 | 266 |
| 1868 | 96 | 1880 | 222 |
| 1870 | 227 | 1882 | 237 |
| 1872 | 264 | 1884 | 297 |
| 1874 | 269 | 1886 | 262 |

Source: Statistics of the state of Tasmania for relevant years.

TABLE II. 5

STATE AND NEW NORFOLK MUNICIPALITY HOP AREA AND NEW NORFOLK %, SELECTED YEARS 1885 - 1935

| Year | State Area (Hectares) | Area in New Norfolk Municipality (Hectares) | % in New Norfolk Municipality |
|---|---|---|---|
| 1885 | 261.8 | 210.0 | 80.2 |
| 1891 | 151.0 | 114.5 | 75.9 |
| 1900 | 252.5 | 163.1 | 64.6 |
| 1905 | 295.0 | 191.0 | 64.8 |
| 1912 | 416.0 | 286.5 | 68.9 |
| 1922 | 572.0 | 451.0 | 78.8 |
| 1927 | 528.0 | 414.6 | 78.5 |
| 1932 | 345.0 | 293.1 | 85.0 |
| 1935 | 334.0 | 273.3 | 81.8 |

Source: C.B.C.S. Statistics of the state of Tasmania for appropriate years.

Ebenezer Shoobridge was irrigating large fields at Valleyfield, New Norfolk. He had first leased a government farm at New Norfolk in recognition of the excellent soils of the region (Shoobridge records), having several years earlier moved hops from his father's grounds at Providence Valley to Maria Island (see Map I.1), again with little success. A few years later, Shoobridge bought a property at Bushy Park and in 1864 he obtained a yield from his hops only one year from initial planting (Cyclopaedia of Tasmania Vol.I). The significance of this event has been commented upon by Pearce (1976); the effects of the Shoobridge success on subsequent growth of the industry were to be dramatic. Irrigation had been found to be the answer to the problem of summer drought, localities with good soil within reach of adequate irrigation water had been found, hops thrived there and excellent markets existed. Moreover, the crop offered high profits for those who could establish as producers, and Shoobridge made his hop sets freely available. Four years later, in 1868, George Whiting's 13 articles dealing in detail with methods of hop cultivation were published in the colony (Tas. Times, 1868). The growth in planted area in the following 14 years was dramatic, although by no means continuous, and year-to-year fluctuations indicate that not all growers were equally successful.

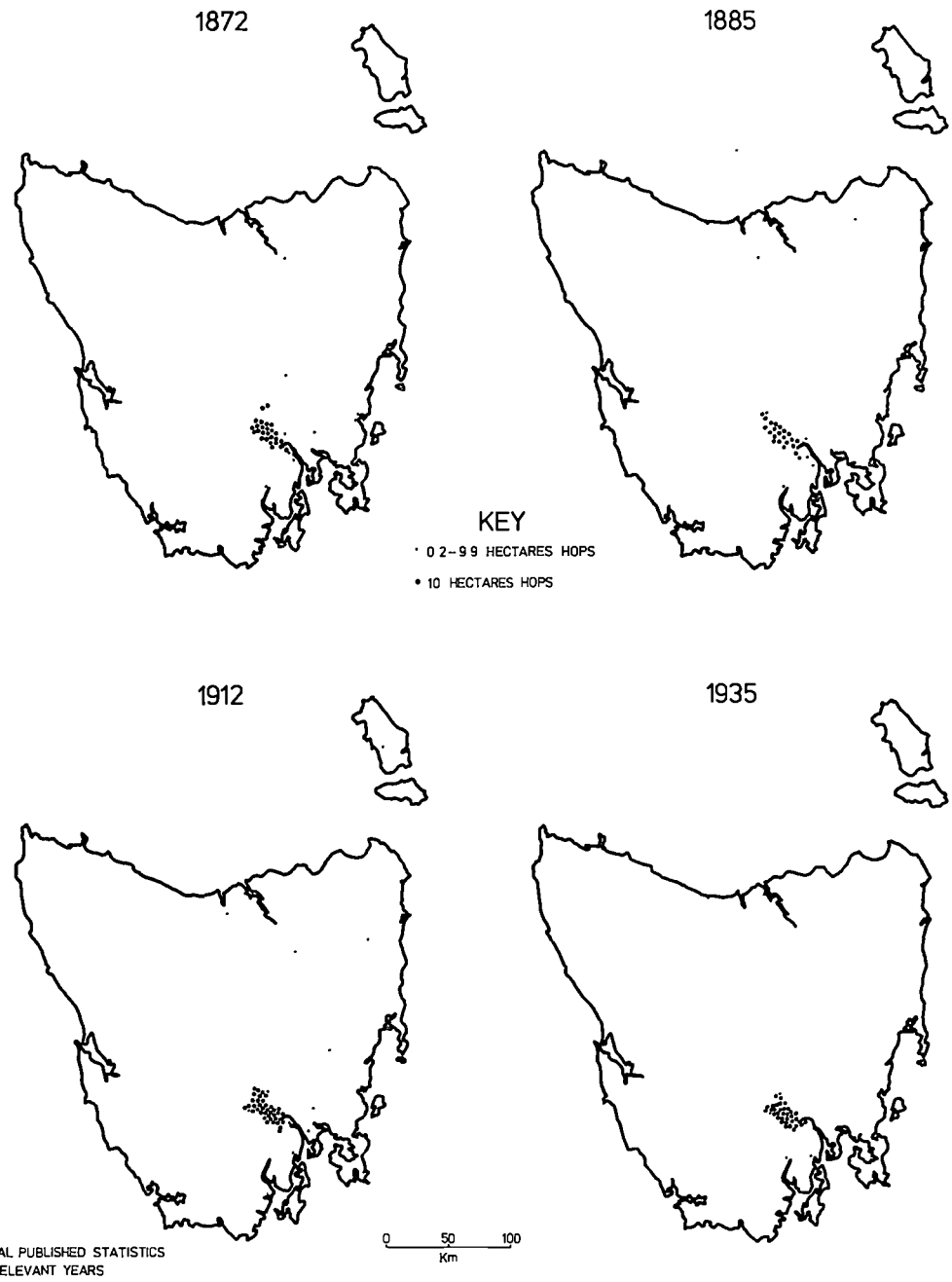
It seems apparent that from about 1870 onwards the core middle-Derwent area at Bushy Park - Macquarie Plains (and for purposes of this study including peripheral localities from Plenty to Glenora) has not been challenged until the recent emergence of large-scale production around Scottsdale in the north-east of the

state. Although detailed distributional statistics have been published since 1866, the main basis of collection has been the municipality, and the New Norfolk municipality embraces both the core production area and more marginal areas of narrow river floodplains as in the tributary valleys around New Norfolk. Unlike the study by Harvey, (1963), in which detailed parish data were available and the distance variable from the core production area could be analysed, this procedure is not possible in the case of Tasmania. Analysis of the percentage of the total hop acreage contained within the New Norfolk municipality however, reveals that this area has tended to withstand external economic calamities more successfully than other districts, and to have gained an increased percentage of the state's total planted area during periods such as the collapse of the early 1930's as is seen in Table II.5.

In 1872, four years after the Whiting publications, hops were being grown on 264 hectares spread throughout 13 municipalities from Launceston to Spring Bay on the east coast (see Map II.1); 80.24% of planted area lay within the New Norfolk municipality which accounted for 82.25% of total production. With the subsequent expansion, by 1882, of production in localities more distant from the core, the New Norfolk municipality's acreage share had fallen to only 70.14%, but the municipality still produced 82.6% of total state output even though some very high yields were reported from several other municipalities. Trial and error was clearly a significant factor, as the number of municipalities reporting hop acreages at this time had decreased to nine by 1882 and the addition of Westbury to the list meant that within the decade production had ceased in five municipalities. By 1885 when the first serious decline in the

# MAP II.1

## HOP GROUND DISTRIBUTION IN SELECTED YEARS; 1872 - 1935




SOURCE OFFICIAL PUBLISHED STATISTICS FOR RELEVANT YEARS

industry had begun, production was recorded in one new locality, Ringarooma, and had ceased in two; Richmond and Glamorgan. The New Norfolk municipality's share of planted area was again over 80%, indicating the first of what was to be a series of contractions to the core area, the most recent one in the early 1970's being actually a contraction to two core areas.

The reasons for the relative instability of production in localities distant from the core are complex. Capital resources were required to 'ride out' periods of low prices or periods when hops simply could not be sold - at any price. These resources appear to have been built up in the core region. Kilns were built in a number of the peripheral localities such as at Margate, around Ellendale, on Maria Island and in the Mersey Valley. However, it was one thing to build a kiln, quite another to successfully cure hops to the high standards required for transport and successful marketing to a brewer. Brewers tended to demand brand names - reputations were more readily established and maintained in the more traditional production localities. Several former growers in the Derwent Valley indicated to the writer that they deliberately did not construct their own kiln for this reason, preferring to sell their crop green to those hop factors who had established markets. Thus, only in times when demand was high could producers in more distant localities hope to compete in the market place.

Statistical boundaries (electoral enumeration districts prior to 1907 and municipalities thereafter) did not remain constant during the period from 1872 to 1935 but broad separation of production and planted area in major centres as opposed to minor peripheral localities, together with verification from sources such as Postal Directories, has enabled the construction of the sequential distrib-

utions which constitute Map II.1. These maps, however, are of somewhat limited assistance as they indicate merely the general growth of the industry between 1872 and 1935 and its progressive concentration towards the Derwent Valley and peripheral southern localities. Mapping at the regional scale where individual hop-grounds can be indicated has been possible for later periods; these maps commence for the mid-1940's and are clearly preferable to the lack of precise detail in the general distribution maps.

The collapse which followed 1884 was due to a number of years in which production exceeded demand and to competition from Victoria which has also increased production in this period. Pearce (1976) has shown the importance of the tariff protection instituted by Victoria which increasingly curtailed the inter-colonial market. In a situation involving price inelasticity of demand, such a reduction in sales means an even greater reduction in returns to growers so that the inefficient, frequently smaller producer is forced out of the industry. The larger producers, who by this time were well established in the middle-Derwent core region, were in a far better position to withstand a few years of low prices than were the growers with more marginal operations whether due to locality or internal cost structure.

The statistical evidence supporting the contention that the core region possessed the larger producers at this time is scant. However, in 1977 three of the large properties with hopground located around the junction of the Styx and Derwent rivers (Map I.3) had descendents of the original hop producers in the locality living on them and these individuals confirmed to the writer that the properties already had hopgrounds which were sizable in the 1870's, were larger than other hopgrounds in the state and have been in

continuous production for over a century. A descendent of one of the original families in the core locality still operates a large hopground of some 24 hectares at Glenora near the junction of the Tyenna and Derwent rivers in the core region (MapI.3). This hopground also has been in continuous production for over a century and constitutes over 75% of total farm income, the remainder deriving from livestock activities. Reduced acreage therefore occurred more often in the more distant localities rather than in the core, although in the collapse which followed 1884 the New Norfolk municipality also lost acreage and it is not possible to ascertain to what extent, if any, there was reduction in the core area.

The process of concentration of producing area within the core region has been termed 'agglomeration' by Harvey (1963) in his study of the Kentish hop industry. This term is one more commonly applied in the manufacturing context, but hop production has certain similar attributes to manufacturing. There are, as Harvey points out, economies to be gained from establishing any new hop acreage in or near the existing locations. For the many small growers in the Derwent with only a few acres of hops it was not economic to build an oast house or kiln; the desirable area before a kiln was warranted seems to have been about 4 hectares (Whiting, 1868) and while many growers with fewer than 4 hectares built kilns this probably reflects the substitution of labour for capital since much of the cost of wooden kilns was due to the input of labour required in their construction. Only the larger kilns were of brick and circular in construction (Pearce, 1976). Kiln construction costs varied from only £20 to several hundred pounds or more, depending on type, labour inputs and whether materials were available on-farm. Harvey states that 12 hectares was generally necessary

to keep a well-designed oast house fully employed in mid-nineteenth century Kent, and there is no reason why this would not have also been the case in Tasmania at the time. Improvements in kiln design such as circular rotating floors which gave more uniform drying were also occurring; naturally, such improvements tended to favour the larger kilns, leading to further advantages for the established, large growers in the core locality. Harvey points also to other economic considerations that tended to lead to the concentration of hop production; among these, the accumulation of capital resources in established, successful hop growing localities was usually greater than capital accumulated elsewhere and further perpetuated the dominance of the core. While costs of hop cultivation have been shown to be high in comparison with other forms of farming, the rewards of successful hop cultivation were also considerable at least in some years. For example, in 1866 the price paid for Tasmanian hops ranged from 1/0d to 2/6d per lb. (Gov. Stats., 1867). Assuming a fairly typical yield of 6cwt. per acre (Gov. Stats., 1855 - 1896), reference to Table II.3 indicates a loss of about £10 per acre at the lower price and a gain of £44.18.0 per acre at the higher price. By 1884 the maximum price paid for Tasmanian hops was only 0/11½d per lb. but by the following year it had improved marginally. Good years led to expansion not only because it was "far easier for a farmer already cultivating hops successfully to finance further expansion than it was for the ordinary arable farmer with a low turnover, to develop an initial acreage", (Harvey, 1963, 132). In addition, the successful hop farmer was able to build up capital reserves over a period of years and was therefore better placed to withstand years of low prices or poor yields so prevalent in the hop industry.

Other external economies accrued from the fact that skilled labour was more readily obtainable in established hop areas and hop buyers and factors were also more willing to lend money for hop production in established areas than in new locations; here, if not well understood, the hazards of production were merely compounded.

It is apparent then, that the first half century or so of hop cultivation in Tasmania witnessed the emergence of a clearly dominant region with periodic expansion beyond this core representing the attraction of the crop during periods of good returns. In the context of the time when the industry first established, it is hardly likely that any other area in Tasmania could offer the attractions of soil and irrigation possibilities, as well as the cheap water transport for hop poles and hops that the River Derwent offered. However, once having acquired its dominance, certain other cost advantages accrued for producers in the core area, among them being the various hop factor and co-operative arrangements for production and marketing which have operated in the industry. These elements have remained important to the present time, although altered in structure and relative importance, and will be analysed in more detail in Chapter IV.

Expansion and contraction of extensive margins to 1935

The first half century or so in the hop industry in Tasmania may be regarded as a period of trial and error as decision-makers groped in an uncertain environment for ways of achieving the pay-off that successful cultivation of hops offered. However, as pointed out earlier, this view probably stretches the concepts implicit in the theory of games (von Neumann et.al., 1944) beyond

reasonable limits, and certainly it lies beyond the possibility of empirical verification. By 1885 the lesson of irrigation had been learned; lessons on the more subtle economic advantages of concentration and agglomeration were perhaps another half-century away. The half-century from 1885 was to begin with a depression in the hop industry and to end similarly, and the years between were to be by no means unequivocally good for hop producers. The end of the period however, was to see a very different spatial distribution of hop production than that which prevailed throughout most of the period in question.

One of the difficulties of macro-scale agricultural studies is the extent to which important details at the level of the individual farm unit are ignored. These details, in so far as it is possible to extract them in a meaningful form, are of considerable value in explaining the subtle transformations that characterise the economic landscape. Without such studies, the appearance of general change in the spatial distributions of crop types may well be assumed to have explanation which is characteristic of a whole range of economic activity, rather than being peculiar to one activity only or to one segment of an activity class.

Much of the change that characterised the industry during the period in question certainly was due to external economic conditions. Pearce (1976) has shown how broad fluctuations in acreage under hops corresponds with fluctuations in the general economy, but the correspondence is only a general one and growers in different size classes and with differing internal farm organization will be seen in later sections to have been differentially affected over time and according to their locality. It remains true however that

with each upswing and subsequent collapse in the general economy, the hop acreage has become increasingly concentrated towards the core. In other words, the extensive margin of production has contracted.

In times of external economic calamity, the individual farm operator is normally faced with the question of whether he can survive with low prices for his produce; hop producers in Tasmania have known from time to time that they would not be able to sell their forthcoming crop - at any price. As has been mentioned, the system of hop factoring affected the spatial distribution of hop production. Factors knew in advance the quantity of hops they could sell, and they preferred to contract growers to produce specifically for them. In turn, they supplied the growers' requisites, sometimes at cost savings to the grower, and deducted his material costs from his returns. Often growers obtained other farming requisites and even household items and food through factors against the profit from their enterprise. The result was that growers needed to know little about marketing of hops, supply and demand for their product or likely price changes. Factors, on the other hand well understood the price inelasticity of demand situation within which they operated, and usually restricted acreage expansion on the part of their growers as part of the purchase contract. At no time has there been more than five or six factors in Tasmania, and collusion between them on pricing and contract terms certainly cannot be ruled out.

Detail is scanty, but it is evident from the survey of former growers that many small producers had little other cash income apart from hop returns. Prior to the period in question, a detailed list of hop producers and their planted areas appeared in

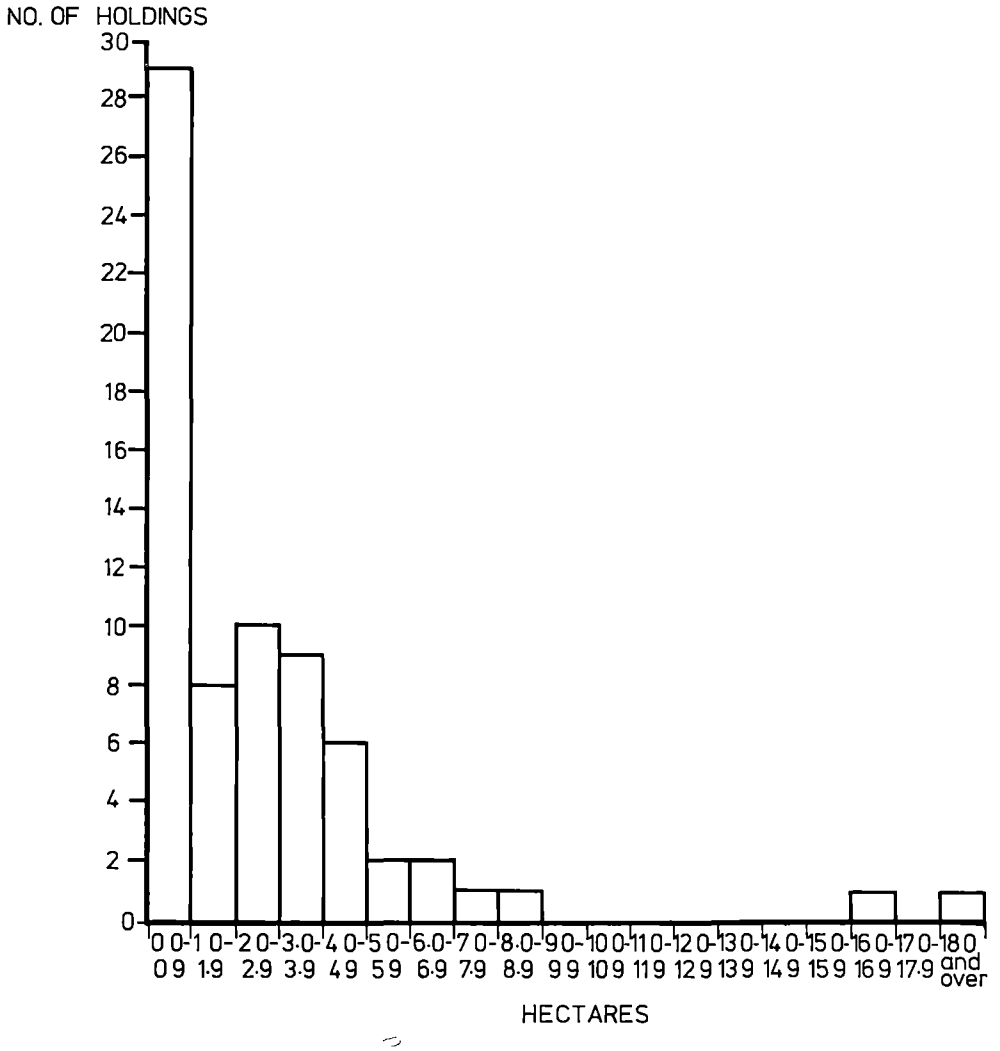
'The Mercury' (July 14, 1870) and from this an indication of the size distribution of hop areas on hop farms in the period both before and after the collapse of the early 1880's may be obtained. Of the 70 growers in the state (see Fig. II.1), all but two producers had less than nine hectares of bearing and non-bearing hops (shown as 1year, 2year and 3+year hops). The two large producers had respecively 16 and 20 hectares. At the lower end of the distribution, 29 producers had less than one hectare, and the median size of holdings was slightly more than one hectare. Mean hopground size per farm unit was 3.24 hectares of bearing area while a number of growers had 0.2 hectares or less.

The contrasts in area devoted to hops reflects both the high establishment costs for hopgrounds and the fact that therwere scale economies if capital could be accumulated to permit the development of up to 40 or 50 acres (16 - 18 hectares) of hops. These scale economies were to prove important in the long-term survival of certain hop enterprises. As the state's planted area in hops had declined to only 151 hectares by 1891 and only 1.21 hectares at Westbury and 0.81 hectares at Franklin lay beyond the confines of the Derwent Valley, it is likely that many of those who left the industry would have been growers with only a small area under hops; larger growers in the core area certainly survived.

While a number of small producers, in common with large hop growers, had other farming activities, few who depended entirely upon their own family labour could manage to strike a balance such that other activities could be engaged in with sufficient energy and productive outcome to provide needed capital reserves for years when losses were incurred from the hop enterprise. The cost-structure of hop production, particularly the procuring of poles, manuring and

# Figure II.1

## Size-distribution of hopground holdings 1870




SOURCE: 'THE MERCURY,' JULY 14th, 1870.

such other unavoidable inputs even before the cost of engaging pickers, was such that failure to show at least some profit at the end of each year could threaten the farm with bankruptcy. A large arable farm with only a small area of hops, say three hectares, might survive, but few such farms existed as the entrepreneur's labour could not be divided adequately on such a unit and employing labour for either hop production or the other enterprises would merely have compounded the costs and increased the risks that were inherent in hop production. Some fortunate small producers were able to remain in business during poor years because unpaid family labour was available for harvesting and other tasks normally requiring employment of casual labour. Usually it was considered that two hectares could be worked by one man assuming that he was involved in no other enterprises; it follows that some family farms had up to perhaps eight hectares without the need for permanent labour, but the majority of family farms were small (4 hectares and less) and had only supplementary sources of income rather than fully diversified farming activities. Income earned from supplementary activities was rarely such as to affect materially the economic dependence on hops.

In the Derwent Valley and its tributaries the majority of small hop producers had some land suitable for hops by virtue of soil type and available irrigation water, and usually some valley-side land of rough to very rough and steep character suitable for either rough grazing of sheep or small-fruit plots and the like. Usually a house cow or two, poultry, pigs and a vegetable plot completed the array of supplementary activities. The fact that living costs for such growers were relatively low however was of only minor importance in the survival of the production unit because the investment in even the smaller hopgrounds was substantial and

so were the losses when they occurred. The grower still had to pay the factor for the year's supply of string, wire, possibly poles, fertilizer, drying costs, bales, tools and transport costs for green hops. Seasonal labour costs (if any) interest on land or other borrowings and living costs still had to be met while loss of income from hops was sometimes total or near-total.

Economies of scale in the case of the large producers not only enabled a more reliable and uniform product (Shoobridge records) but allowed for higher marginal product or marginal returns; there was therefore on these holdings a greater capacity to withstand years of poor prices or low yields or other catastrophe as occurred from time to time. The product was more reliable simply because many small growers who attempted to cure their own hops failed to produce precisely the required amount of drying, thereby damaging the product. Larger growers had more sophisticated kilns, and possessed or hired skilled operators whose experience with the drying process was an invaluable asset. Pearce (1976) has pointed to the advantages of large rotating drying floors and hot-air blowers generally only feasible in the very large, costly kilns owned by producers, and later factors, in the core locality. In good years, capital accumulation on large farms was considerable, and while some could be reinvested in improved plant and equipment, reserves could also be established against possible price declines or disastrous harvests; survival was therefore much more assured.

With increasing numbers of growers again entering the industry after 1895 (see Fig. II.2 and Map II.1), a number of marginal localities once more commenced production. This is not to suggest that they could not produce hops profitably in years when

## Hopground area and no. of growers; 1885 - 1935

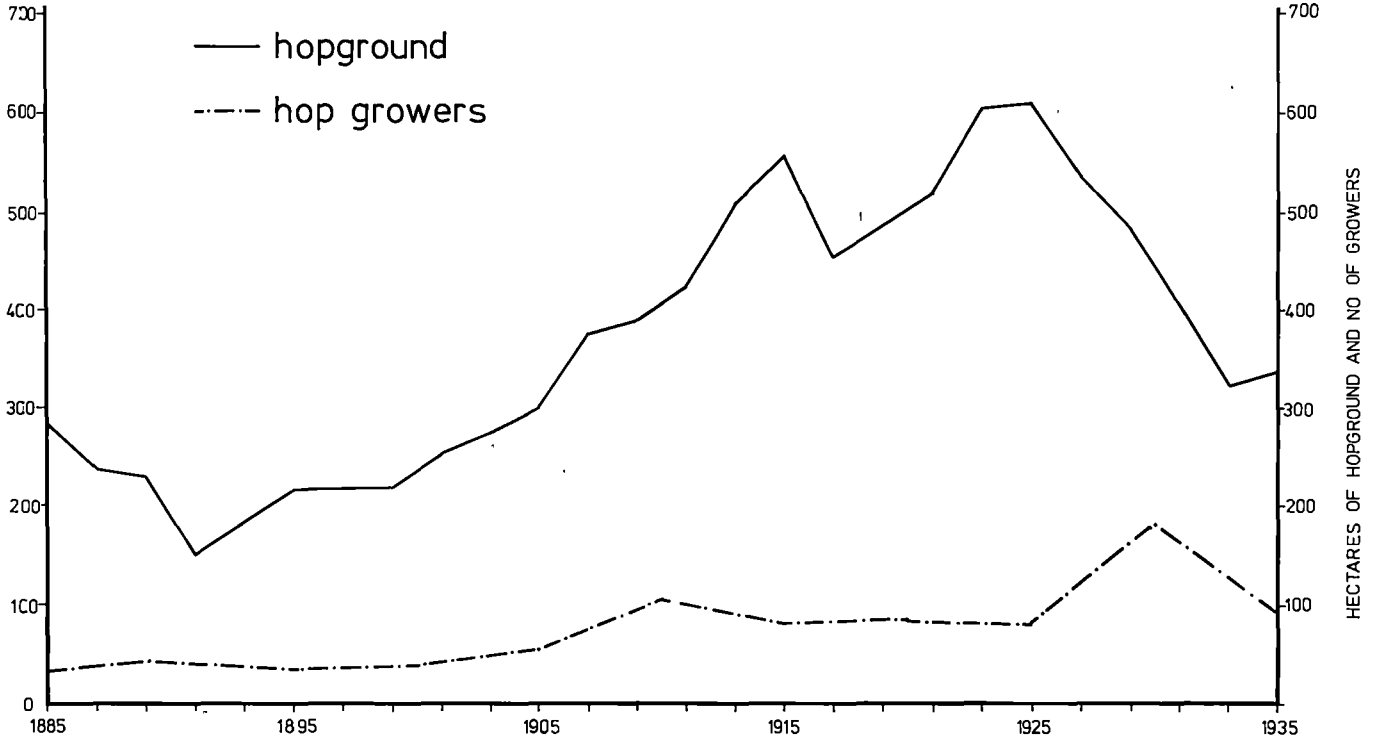



Figure II.2

SOURCE STATISTICS OF THE STATE OF TASMANIA AND C B C S ANNUAL STATISTICS FOR RELEVANT YEARS, GROWER NOS TASMANIAN POSTAL DIRECTORIES

prices were relatively high - say around 1/6d per lb., but they were at a disadvantage when compared with the core region in the Derwent which had larger hop units, tended to sell its hops more readily at higher prices and had accumulated assets or access to finance from such assets which allowed for years of lower prices or poorer yields.

Smaller, mixed farms offering viable alternatives to hops were rare. Those which had income from other sources such as smallfruits or orchards (apples and pears) usually had hops as the major enterprise. From interviews with former growers, some of whom have been involved in hop growing for over 70 years and some of whom had ancestors involved in the industry before the end of the nineteenth century, the writer was able to ascertain that in very few cases was hop farming not the major economic activity on these farms. In several instances, fairly large areas of apple orchard were operated in conjunction with hops, but in each case the hop farms fell into the medium or large category, having more than 4 hectares of hopground. Elsewhere, hop farms which had an acre or two of raspberries or loganberries for example earned income from the large jam manufacturer who also happened to be the largest hop factor. Debts to the hop factor for string, wire, sprays (insecticides) and interest on working capital were therefore also repayable from smallfruit earnings; this tended to tie the operations of the small hop grower even more closely to the interests of the hop factor. It appears, however, that for most hop farmers management of the hopground constituted a full-time activity, leaving little time to engage in other enterprises apart from minor livestock activities or subsistence activities.

By 1900 the New Norfolk municipality had only 64.6% of the bearing area of hops for the state (see Table II.5), and 12 municipalities including Selby (Launceston), Ringarooma, Westbury, Russell and West Devon in the north of the state and Oatlands, Brighton, Richmond and Clarence in the south had hop-grounds. In the next three decades the extensive margins of production expanded still further with growers in localities as far apart as Kempton, Campania, Oyster Cove, Cygnet, East Risdon, Margate, Westbury, Latrobe, Mathinna and Flinders Island, (Postal Directories, 1900 - 1930).

There is no doubt that during years when yields were satisfactory and prices were high the production of hops was seen as an attractive enterprise in the period in question Cyclopaedia of Tasmania, Vol. II). Although prices for hops fluctuated considerably during the period, and each farm unit had its own cost structure which depended on a complex of inputs, certain costs are known or can be estimated for the period as Pearce (1976) has demonstrated, so that towards the end of the century a selection of two hypothetical yield and price conditions (see Table II.6) can be used to indicate possible returns to growers. It is assumed that initial establishment costs of about £225 per hectare have been expended. Small growers often avoided the cost of a kiln so that their interest on establishment costs would have been lower, but they would need to pay to have their hops dried or would sell their hops green for a lower price. Growers who rented their land would have had higher costs not shown here but they would have had lower interest on establishment costs.

TABLE II.6
ESTIMATES OF COSTS AND RETURNS TO HOP PRODUCTION UNDER TWO HYPOTHETICAL YIELD AND PRICE CONDITIONS c.1900

| Price per lb. | Interest on capital | Operating costs per 15 cwt. | Profit or loss per 15 cwt. |
|---|---|---|---|
| s d | £ s d | £ s d | £ s d |
| 0 7 | 9 0 0 | 60 0 0 | -20 0 0 |
| 1 0 | 9 0 0 | 60 0 0 | 15 0 0 |
| 1 6 | 9 0 0 | 60 0 0 | 57 0 0 |
| 2 0 | 9 0 0 | 60 0 0 | 99 0 0 |
| 2 6 | 9 0 0 | 60 0 0 | 141 0 0 |
| | | costs per 8 cwt. | profit/loss |
| 0 7 | 9 0 0 | 46 0 0 | -28 17 0 |
| 1 0 | 9 0 0 | 46 0 0 | -10 4 0 |
| 1 6 | 9 0 0 | 46 0 0 | 12 4 0 |
| 2 0 | 9 0 0 | 46 0 0 | 34 12 0 |
| 2 6 | 9 0 0 | 46 0 0 | 57 0 0 |

Source: Pearce (1976), Harvey (1963) and author's calculation. Table assumes £2 per cwt. for picking and processing. Interest on capital is hypothetical - some growers built and owned kilns yet had debts for land or working capital; others were debt-free.

TABLE II.7
TASMANIAN HOP PRICES, SELECTED YEARS, 1901 - 1920.

| Year | Price per lb. | Year | Price per lb. |
|---|---|---|---|
| | s d | | s d |
| 1901 | 0 9 - 0/10 | 1911 | 1 3 - 1/9 |
| 1905 | 1 3 - 1/6 | 1914 | 1 4½ |
| 1906 | 1 0 - 1/6 | 1915 | 1 4½ - 1/6 |
| 1909 | 0 7 - 1/0 | 1920 | 2 2 (Feb.) |
| 1910 | 0 9 - 1/10 | | |

Source: C.B.C.S. ? Gov. Stat., hop prices for relevant years.

It is clear from Table II.6 that hop production would have been very attractive for any farmer with sufficient capital, land and inclination.

When Table II.6 is compared with actual hop prices prevailing from 1901 to 1920 (Table II.7) it can be seen that the key variable would have been the yield, for at 15cwt. per acre (1,887kg. per hectare) in very few years would profits not be made whereas at 8cwt. per acre or less it is clear that unless prices were above about 1s.3d. per lb. losses would have occurred. Examination of records of yields for the different municipalities reveals considerable variation but again the statistical information needs to be treated with caution as yields from municipalities with only a few acres and probably only one or two growers have apparently been aggregated with total production and yields for larger municipalities. Thus individual growers in relatively distant localities may appear to have obtained good yields when in fact they did not, and vice versa. Nevertheless, the very large planted area in the New Norfolk municipality is seen to yield consistently better than most areas, although in some years certain areas seem to have had exceptional yields as for example in 1921-22 when 4 hectares in the Huon yielded 2,688 lb. per acre or 24cwt. (3,019kg. per hectare). It must be remembered however that the New Norfolk municipality yielded consistently better over its very extensive planted area despite periodic attack by red spider and such localized but relatively common problems as wind damage and floods. Naturally, these problems arose elsewhere, but in good years on a small planted area in a given municipality the yield will seem quite high when compared

with the aggregate fortunes of a municipality having 20 or 30 times the number of growers and planted area, (see Table II.8). This point needs to be borne in mind when considering favourable regional reports on hop production such as several pertaining to the Mersey Valley (Latrobe) in the North West Post and Advocate newspapers in the early decades of the century.

It should be clear from the analysis to this point that detailed, accurate statistics are essential for adequate study of agricultural change and adjustment at the micro-regional level. Until about 1935 it seems that within the limits mentioned so far, the yield statistics for the different municipalities are fairly accurate. As with much farm information, a major difficulty is to ascertain that growers report their actual yields and not simply their best individual yield multiplied by their acreage. There is of course with hop production, the additional problem of hop acreage not coinciding with ground acres. In a hop ground, considerable area is taken up by the straining poles, and especially in elongated river-floodplain grounds as are common, the difference between actual planted area and total ground area may be as high as 30 or 40%. It has been common within the Derwent Valley and the south of the state to measure area in terms of 'hop acres' which consist of 1200 hills of hops regardless of spacing. Although yields will vary with spacing of plants and with stringing methods, this variation is not likely to be as great as that due to the confusion of simple acreage with planted area.

Figure II.2 shows that planted area under hops increased from 1891 until it peaked in 1925, but Table II.5 shows that following initial expansion of the extensive margin of production

TABLE II. 8

DISTRIBUTION OF HOP YIELDS BY MUNICIPALITY, SELECTED YEARS 1892 - 1932 (lbs. PER ACRE)

| Municipality | 1892 | 1902 | 1912 | 1922 | 1932 |
|---|---|---|---|---|---|
| New Norfolk | 1,483 | 1,200 | 1,274 | 1,633 | 1,928 |
| Hamilton | 639 | 810 | 638 | 1,244 | 1,691 |
| Huon | | | | 2,688 | 800 |
| Clarence | | | 1,078 | 710 | 1,200 |
| Kingborough | | | 1,141 | 1,135 | 1,448 |
| Glenorchy | 1,415 | 1,100 | 1,008 | | |
| Richmond | | 200 | 1,141 | 276 | |
| Port Cygnet | | | | 1,666 | |
| Oatlands | | | 638 | | |
| Green Ponds | | | 638 | | |
| St. Leonards | | | | 400 | |
| Westbury | 2,000 | 1,000 | | | |
| Evandale | | | 1,120 | | |
| Fingal | | | 1,120 | | |
| Flinders Island | | | 1,120 | | |
| Mersey | 560 | | | | |

N.B. Aggregated yields underlined.

Source: C.B.C.S. Statistics of the State of Tasmania for relevant years.

in the 1890's consolidation of acreage within the New Norfolk municipality commences again as early as 1900, and is virtually continuous from then until the Great Depression. When this point is followed by an analysis of the yields from the various municipalities (see Table II.8), the physical superiority of the middle-Derwent region becomes evident. Over a number of years, relatively low yields occur in the Hamilton municipality which includes the area north of the Tyenna River from Westerway to beyond Ellendale. Even in 1932 when the yield in this municipality was recorded as 15.1 cwt. per acre, this figure was below the 17.2 cwt. figure for the New Norfolk municipality. It is evident then, that in a number of years growers in the Westerway-Ellendale area would have been struggling to show a profit. In fact, many appear to have remained in production only because they reduced overheads by selling hops green, and they were carried through bad years by hop factors who needed their output and were willing to write off losses against better years.

It is essential to note in the discussion of yield data to this point in time that there is a serious question as to accuracy pertaining to the yield statistics as published by the Commonwealth Bureau of Census and Statistics between 1930 and 1949. Pearce, (1976, 154) stated that:

> "the most striking aspect of the Tasmanian hop industry between 1930 and 1945 was the extremely high yield per acre figure achieved. It was consistently high - higher than it had ever been before, or than it was again over such a long period of years".

However, total state production figures in dry weight for a number of years during this period have been obtained by adding the

individual municipal dry-weight production. Unfortunately, in the case of the Westerway - Ellendale farmers in the Hamilton municipality there was no dry-weight figure available. The Census Bureau mistakenly used the green-weight figures for this municipality (the ratio varied from about 3.81:1 to 4.0:1), adding these to total state dry-weight production and dividing by bearing area to obtain state yield figures. The same procedure was used to obtain a yield figure for the individual municipalities and thus there is considerable unreliability associated with those municipalities which had a high proportion of their hops sold as green hops during this period. Unfortunately, original farmer stock and crop returns for the period have been destroyed so that it is not now possible to obtain a more accurate indication of actual yields for the period.

The reduction in planted area following 1925 was due to overproduction and consequent low prices. At this time, as Pearce (1976) demonstrates, the impact of increasing production in Victoria was being felt by Tasmanian producers. Further expansion in planted area took place after 1926 so that the extensive margins of production contracted only gradually from 1925 until the effects of the general depression made a dramatic impact, with a reduction of 32% of bearing area between 1930 and 1933. Although Tasmanian Postal Directories for the period only show nominal growers, not necessarily actual farm operatives, they may be used to obtain localities in which production occurred, and cross-checked with municipal statistics for planted area. By 1930, production had contracted entirely to the south of the state, and growers remained in five localities beyond the

main Derwent Valley regions: Kingston; Margate; Ranelagh; Cygnet and East Risdon. At this time, there were listed 183 growers although many would have operated partership holdings, but by 1935 the list of growers was reduced to 84 with only three localities beyond the Derwent being represented, namely Ranelagh, Margate and Kingston. More significant than the contractions beyond the Derwent was the reduction in acreage and grower numbers in the Westerway - Ellendale area, and to a lesser extent in the New Norfolk - Lachlan - Molesworth region. In 1930, 76 growers were listed in the Westerway - Ellendale area and by 1935 the number was reduced to 30. From 1930 to 1933, bearing area in the Hamilton municipality declined from 53.8 hectares to 24.7 hectares, rising again by 1935 to almost the pre-depression level at 49 hectares. This reduction in bearing area is much more pronounced than the 32% decline for the state as a whole during the same period, being a decline of 54.1%. The Magra, Lachlan and Molesworth areas suffered a decline from 58 to 32 growers between 1930 and 1935 but reductions in planted area are impossible to separate from the remainder of the municipality which includes the core area. The latter region lost only four of its 21 growers during the same period. Acreage decline for the municipality as a whole during the 1930 to 1935 period was 31.5%, or slightly less than the state average, from 399 hectares to 273 hectares of bearing area.

It is apparent from the analysis to this point in time that the Derwent Valley contains three distinct sub-regions within which the extent of spatial adjustment to changing internal and external economic conditions shows discernible differences,

with general contractions being least marked in the core middle-Derwent, quite pronounced in the Westerway - Ellendale area and somewhat intermediate in the New Norfolk - Lachlan - Molesworth area.

Against the background of contraction in the early 1930's however, the expansion of hop growing to many other parts of the state after 1891 constitutes a general enlargement of the extensive margins of production. The survival of apparently viable operations for a number of years in some of the more distant localities such as Westbury and the Mersey Valley indicate that concentration in the Derwent Valley, once achieved, brought with it a whole range of further advantages which would ensure its dominance until general economic circumstances were again to change in the early 1960's. Thus the many small producers in the Westerway - Ellendale area could not have survived had they been more distant from the core area, and while eventually virtually all small producers were to be eliminated from the industry, the marginal nature of the Westerway - Ellendale area was to ensure that this area would be the first to lose its small producers.

The contraction of the extensive margin of production by 1935 had further consolidated the position of the middle-Derwent core, with only two of the state's 10 larger growers actually beyond the core, and both of these within 15km. or so of it. It has been shown in Table II.5 that the tendency towards concentration in the New Norfolk municipality had actually been virtually continuous since 1900 despite many changes in the actual location of the extensive margin of production. The depression of

the early 1930's merely confirmed this trend and entrenched the Derwent Valley and three peripheral localities as virtually the only hop producing region for the following quarter-century.

Expansion of extensive margins of production to 1960

The quarter-century from 1935 encompasses a period of expansion of the hop industry, but more significantly it embraces the origins of the period of fundamental locational and structural transformation of the industry. Bearing area increased from 334 hectares in 1934-35 to 581 hectares in 1959-60. The number of growers appears to have fluctuated, increasing before the war and then decreasing during and immediately following to reach a low of 64 in 1947-48, rising again to 99 by 1959-60. Again, simple mean bearing area per grower is relatively meaningless, but insofar as available data will permit, the analysis of this period will be conducted at the micro-regional level.

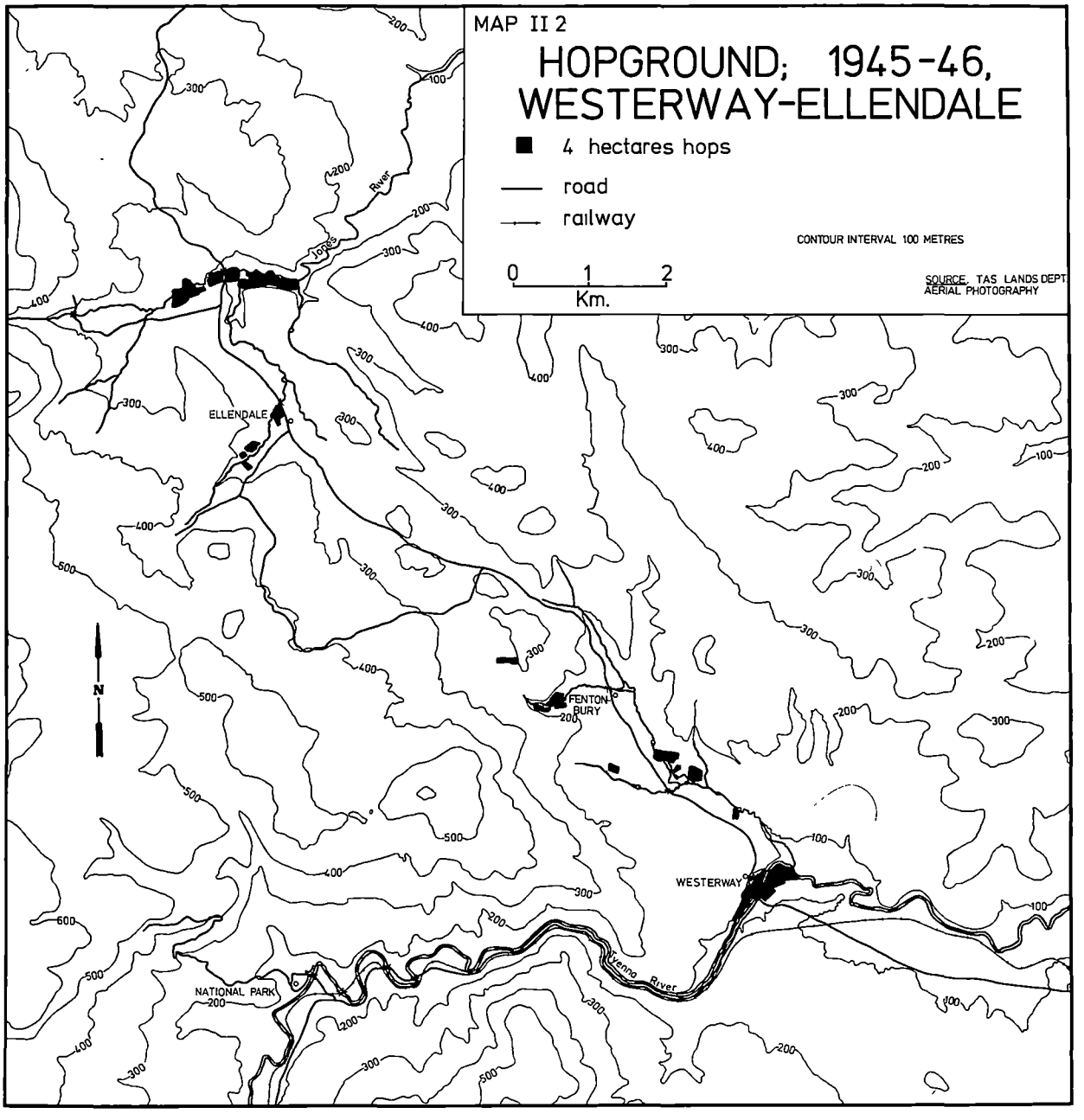
At the beginning of the period, simple weight of green or dried hops was all that mattered to the grower and his efforts were directed at maximizing his yield. At the end of the period, growers were about to be told to replant their grounds with a new variety, Ringwood Specials, developed at the research farm of the Carlton and United brewery at Ringwood in Victoria. The reason for the change was the recognition by brewers of the specific bittering agents of the hop cone, particularly the alpha acids, and the selective breeding of a high-alpha hop. Also, during this period, spurred on by the labour shortage of the war and general increases in the cost of labour, mechanical harvesting was to become a realistic proposition for medium and larger-sized growers. This substitution of capital for labour represented

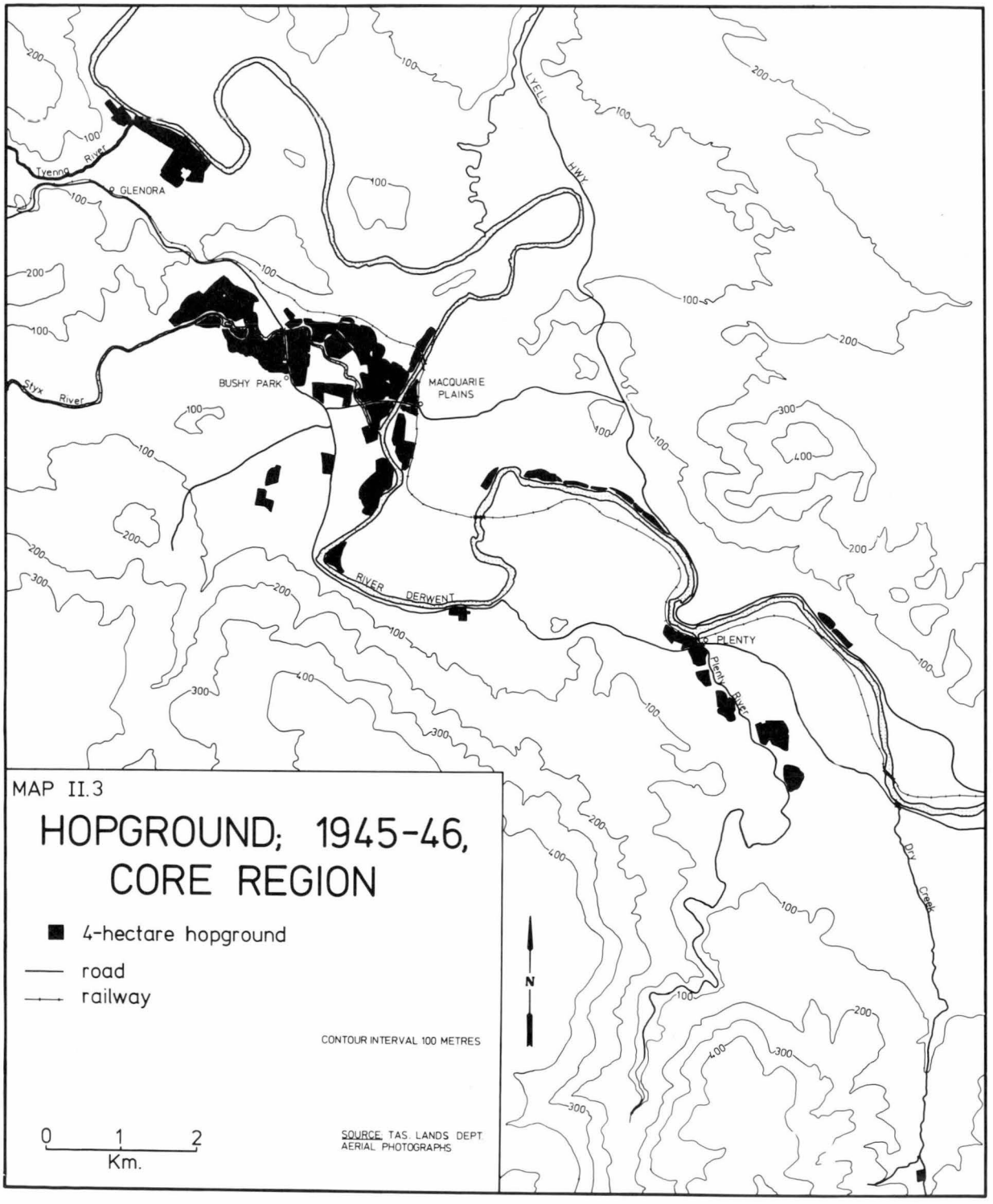
changed economies of scale and consequent changes in the positions of the margins to the 'feasible zone of production' in the productive-function model as illustrated in Figure I.3. Almost inevitably, therefore, it was to lead to the eventual demise of the smaller producers although not while shortages of hops on the domestic market made it advantageous for hop factors to keep the less efficient producers in business.

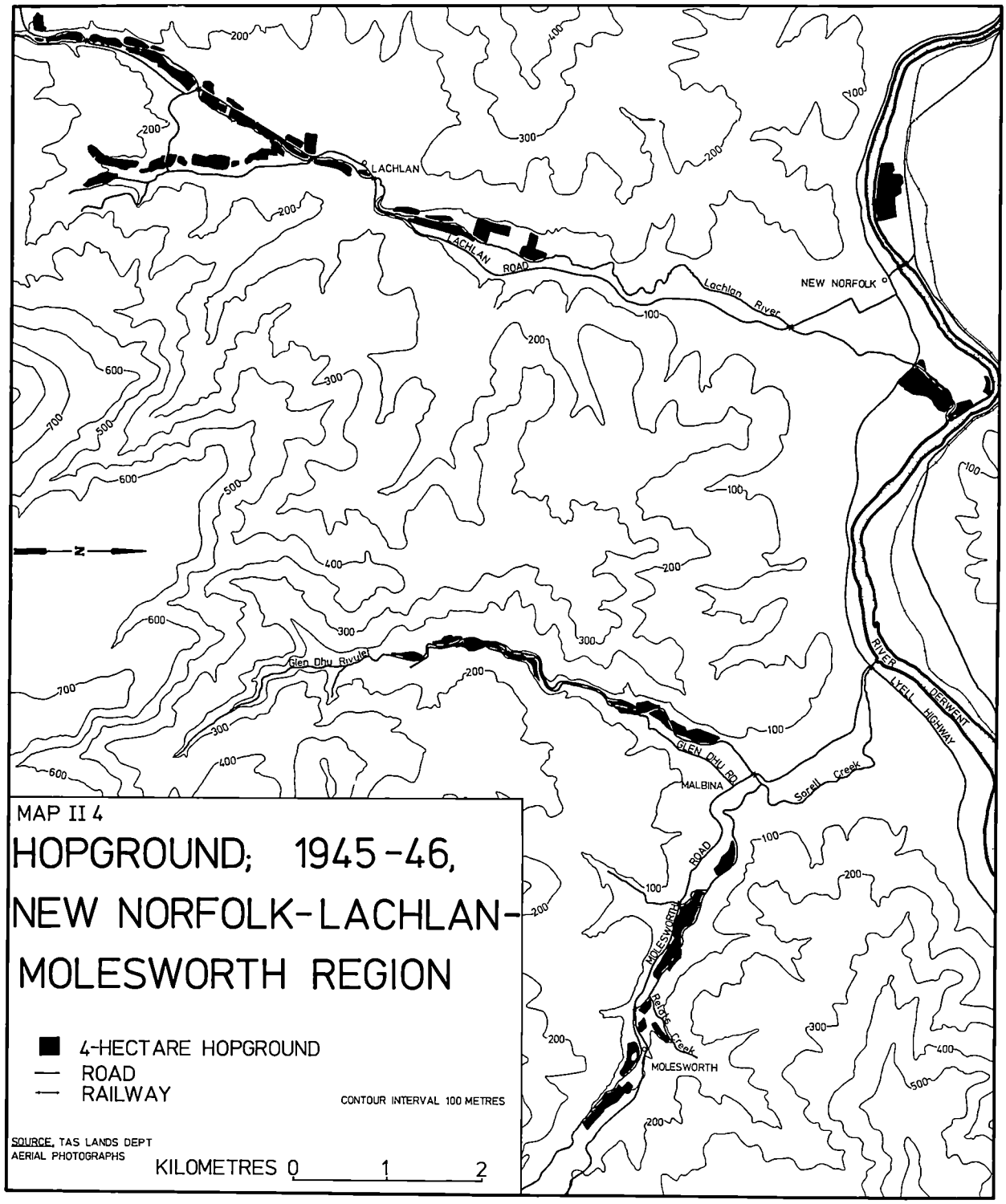
The key variable in the complex of influences affecting the distribution of hop production is clearly the relationship between the supply and demand schedules as shown in Figure I.1. Price inelasticity of demand ensured that with the growth in beer consumption within Australia before, during and after the war (C.B.C.S. 1935-1950), as well as the large-scale destruction of hop grounds in Europe during the war and consequent undersupply of the market in Australia (Hop Producers' Association of Tasmania, 1945), hop producers would be able to obtain a good price for their crop. In 1936, the first of several community kilns was established at Bushy Park by H. Jones and Co. (Cleary, 1977), for the express purpose of drying hops from small producers who lacked the capital resources and skills necessary for drying their own hops. The Kingsholme kiln at Ellendale was also operated by Jones and Co. as a community kiln and other such kilns were located at Westerway and Lachlan in subsequent decades. There was thus the price incentive and the reduction in required capital input to encourage smaller producers to establish hop grounds in this period, and the increase in grower numbers and planted area particularly in the Derwent reflects the importance of these variables.

Without doubt, the most influential element in the expansion of the hop area and in the increasing number of growers in the business after 1935 was the system of hop factoring. Growers were able to obtain contracts which ran for a number of years, and in return agreed not to increase their acreage (Geard, 1939); expansion occurred either because demand exceeded supply and existing growers were offered the opportunity to take up additional acreage or because new growers entered the field gambling upon a shortfall of supply and that they would be able to obtain a contract before their first harvest. The large central kilns for drying of hops relieved small growers of heavy capital outlay for this side of their operation; more significantly, because they provided brewers with a uniform higher-quality hop, many growers were actively encouraged to sell their hops green rather than attempting to cure their own. Thus skills of drying and curing remained more centralised and growers remained more directly under the control of the factors.

In 1945, H. Jones and Co. was responsible for contract sales involving 340 of the 448 hectares of hops produced in Tasmania (Jones and Co. records). As this represented only 38 of the 69 growers in the state it is clear that many of the smaller growers sold through smaller factors as well. That these growers were probably the relative newcomers to the industry and produced in areas beyond the middle-Derwent core area is evidenced also from examination of Maps II.2 and II.4. The 31 growers selling outside H. Jones and Co. averaged 3.46 hectares each while the 38 growers had a mean hop ground size of 8.96 hectares. The majority of the smaller holdings in 1945-46


MAP II 2
HOPGROUND; 1945-46,
WESTERWAY-ELLENDALE
4 hectares hops
road
railway
CONTOUR INTERVAL 100 METRES
0 1 2
Km.
SOURCE: TAS LANDS DEPT AERIAL PHOTOGRAPHY
ELLENDALE
FENTON BURY
WESTERWAY
NATIONAL PARK
Derwent River
Jordan River
N


MAP II.3
HOPGROUND; 1945-46,
CORE REGION
4-hectare hopground
road
railway
CONTOUR INTERVAL 100 METRES
0 1 2
Km.
SOURCE: TAS. LANDS DEPT
AERIAL PHOTOGRAPHS
N
Tyenna River
R. GLENORA
Styx River
BUSHY PARK
MACQUARIE
PLAINS
LYELL HWY
RIVER DERWENT
PLENTY
Plenty River
Dry Creek
100
200
300
400


LACHLAN
LACHLAN ROAD
NEW NORFOLK
Lachlan River
Glen Dhu Rivulet
GLEN DHU RD
MALBINA
Sorell Creek
LYELL HIGHWAY
DERWENT RIVER
MOLESWORTH ROAD
MOLESWORTH
Reids Creek
N
MAP II 4
HOPGROUND; 1945-46,
NEW NORFOLK-LACHLAN-
MOLESWORTH REGION
4-HECTARE HOPGROUND
ROAD
RAILWAY
CONTOUR INTERVAL 100 METRES
SOURCE, TAS LANDS DEPT
AERIAL PHOTOGRAPHS
KILOMETRES 0 1 2

are seen to lie either in the Westerway to Ellendale area or in the tributary valleys of the Lachlan River, Sorell Creek, Glen Dhu Rivulet and Back River around New Norfolk. While on the maps individual holdings are not shown and many growers share contiguous or near-contiguous grounds particularly in the narrow floodplain areas, study of the maps in conjunction with the histograms giving hopground area per farm unit (Figs. II.4 to II.6) indicates that the larger individual holdings are in the middle-Derwent core region. Field survey indicates that the properties along the narrow river floodplains to the south-east of Macquarie Plains (Map II.3) constituted five of the smaller hop farm holdings in the region in 1945. These farms had less than 4 hectares under hops, only one had its own kiln, and only this farm had a second significant commercial activity - orcharding.

Most of the remaining hopground area in the large floodplain area around the confluence of the Styx and Derwent rivers and along the Plenty River was occupied by eight large hop holdings, all of which had at least 14 hectares and seven of which had over 18 hectares. Two farms in the region had over 40 hectares or 100 acres in hops. It was on these larger properties that diversified activities occurred more frequently: one had a major dairying enterprise, although the majority of its income was from hops; three farms had associated apple production of secondary but not inconsiderable importance; five properties, including two with orchards also had substantial sheep grazing for wool and meat. Perhaps representative of the large hop farms was a 373-acre property (149 hectares) with 33 hectares under hops and 28 hectares under apple orchard. In addition, rough grazing of sheep for wool

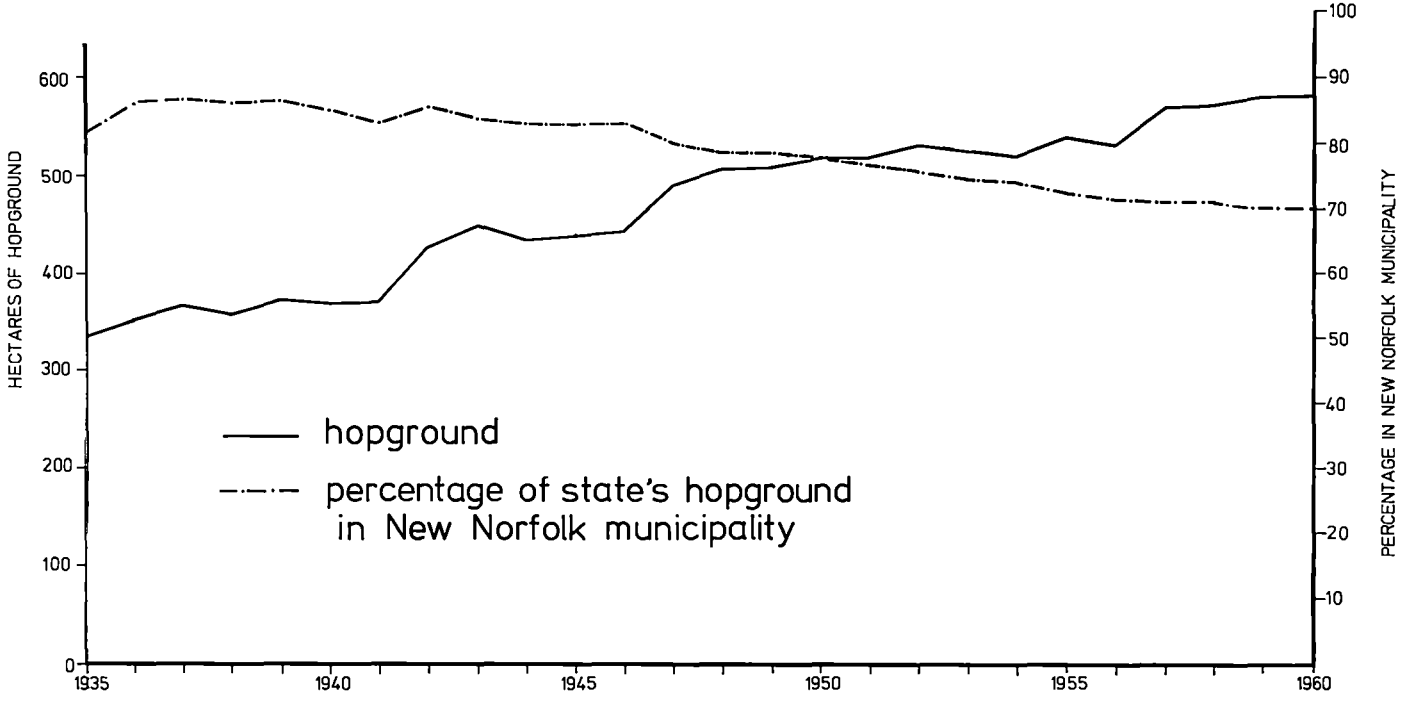
and meat provided less than 5% of farm income. Hops provided 65-80% of farm income in a 'good' year and apples averaged 20-30%. There were 5 full-time labourers employed, and seasonal employment often amounted to well over 100, particularly as apple and hop harvesting periods over-lapped. Investment in hopground and pickers' sheds was four times as high per acre as for apple orchard investments (A.H. Shoobridge).

In 1945, no individual producer having more than 14 hectares was growing hops outside of the core area. Although subsequent expansion altered this picture in the following decade, only two growers were involved. It was not until the development of hop production in the vicinity of Scottsdale in the mid-1960's that the dominance of the core area was seriously challenged.

The expansion of planted area from 1935 to 1960 again reveals the percentage decline in the New Norfolk municipality's share of total state area under hops. The concentration of productive area in the municipality in 1936 was 86% (see Fig. II.3), but despite substantial increases within the municipality in subsequent decades the rate of expansion elsewhere was more marked; by 1960 only 70% of total hopground was in the New Norfolk municipality.

From the detailed analysis of land valuation records it is apparent that the three regions depicted in Maps II.2 to II.4 differ substantially in terms of size-distribution of hop enterprises. The most obvious contrast is that between the middle-Derwent core region and the two Derwent Valley peripheral regions. In 1952 the core region had 17 growers, only nine of whom could be regarded as 'small', or having less than 6 hectares under hops, (see Figure II.4). Seven growers had over 18 hectares each, and although

Hopground area in Tasmania and percentage in New Norfolk municipality
1935-1960




SOURCE C B.C S ANNUAL INDUSTRY STATISTICS

Figure II.3

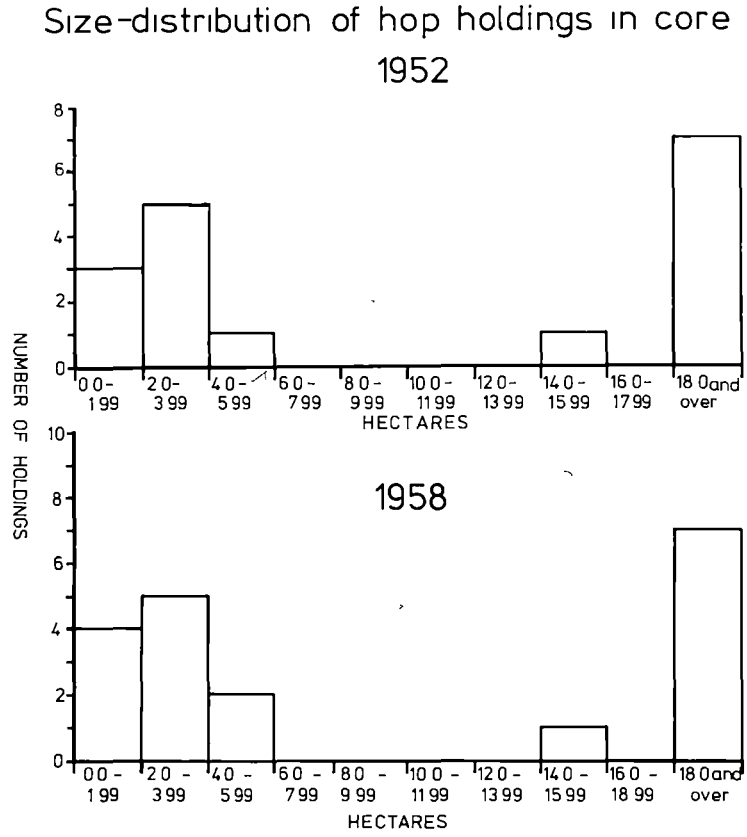



Figure II.4

SOURCE LANDS DEPT RECORDS

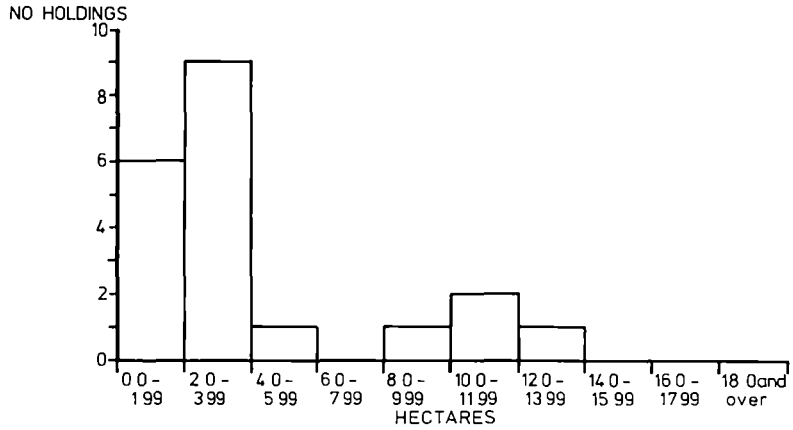
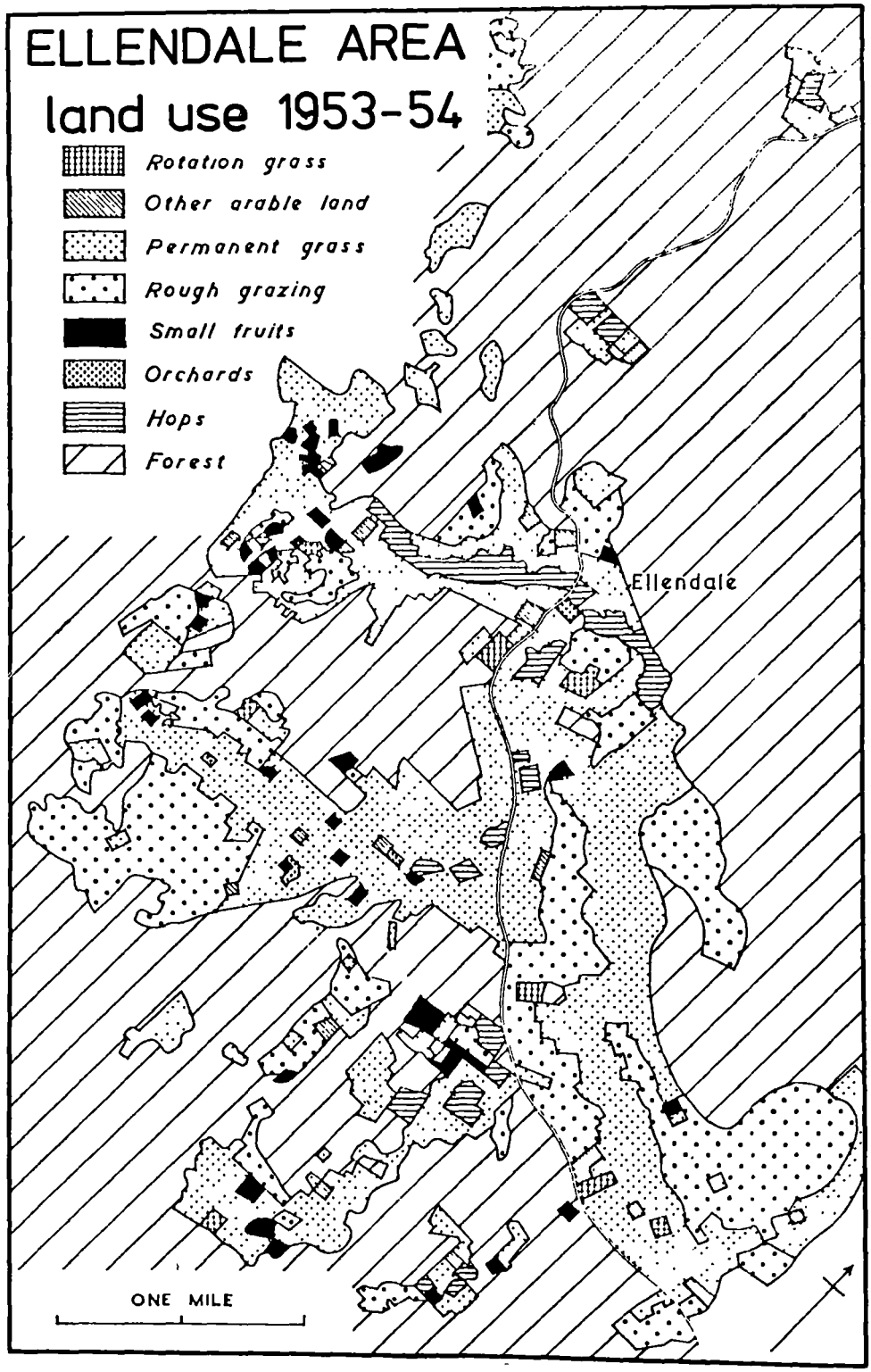



Figure II 5

SOURCE: LANDS DEPT RECORDS

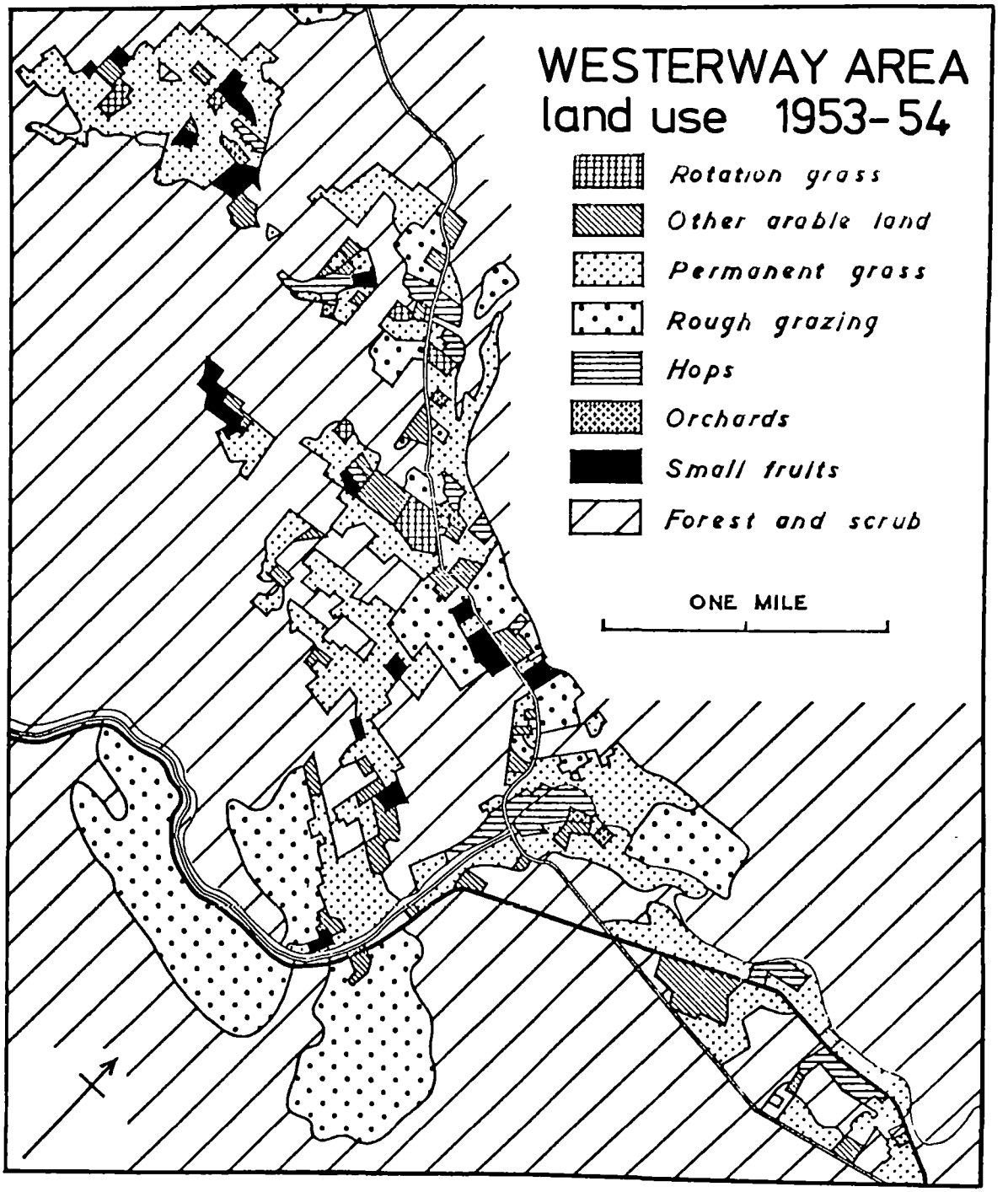
the mean size of holding was 16.9 hectares the median size was a mere 3.9 hectares, indicating that most of the larger growers had considerably more than 16.9 hectares of hops. Total planted area in the core region, calculated from this data source in terms of 'hop acres' of 1200 hills (and therefore hop hectares of 2965 hills) was 286.96 hectares. The position changed very little by 1958 with only two more growers, both small, and a planted or bearing area of 285.82 hectares.

Although land valuation records for the Westerway-Ellendale area in 1952 are not available, data collected on a police district basis for 1954 (Scott, 1957) and confirmed from field survey interviews of former growers in the region as being fairly representative of the situation in 1952 reveal that this area had 32 growers with only 68.9 hectares (probably ground area) or a mean per farm hop area of 2.15 hectares, (ref. Maps II.5 & II,6) Separate hopgrounds shown on these maps represent individual holdings with several exceptions: six growers held individual hopgrounds along Jone's Rivulet near the town name "Ellendale" on Map II.5; and four contiguous holdings occupied the floodplain at the junction of the two highways on Map II.6. Hopgrounds per farm unit in this region were therefore little more than half the mean size of actual bearing 'hop hectares' in the New Norfolk-Lachlan-Molesworth region which in 1952 was 4.1 hectares. Total area in the latter region was 81.95 hectares, and Figure II.5 indicates the distribution of holdings by size class. The contrast between the Westerway-Ellendale region and the New Norfolk-Lachlan-Molesworth region is more evident when their respective histograms for bearing area in the 1957-58 crop year are compared, (Fig. II.6). At this time, both regions had similar total planted area; 99.22




MAP II.5

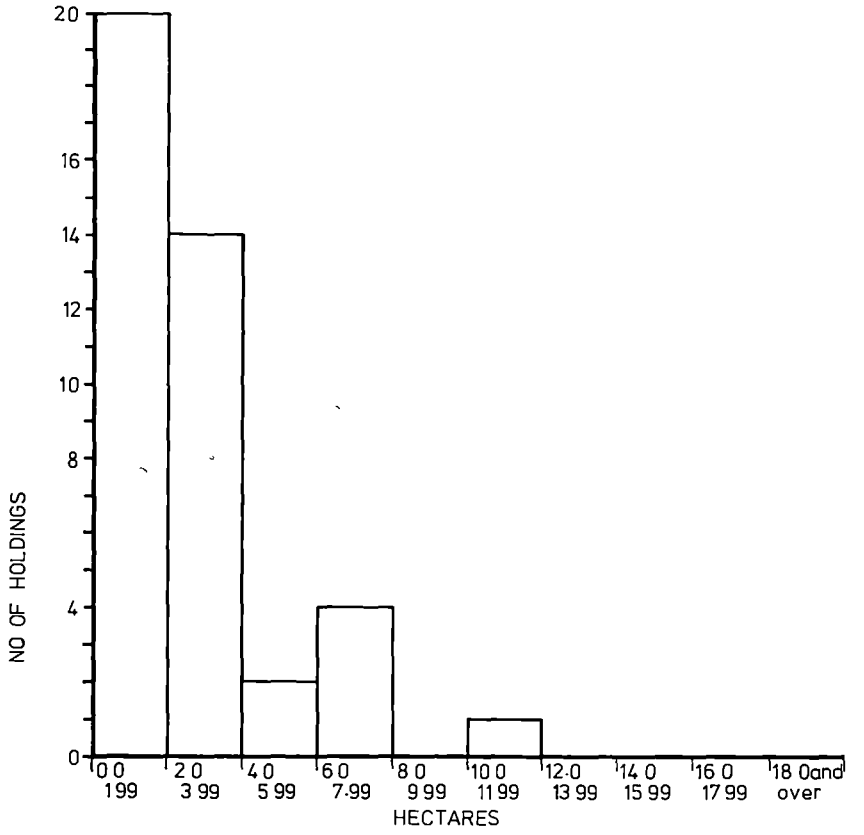
Source: Scott, (1965), 5.




MAP II.6

Source: Scott, (1965), 7.

(a) Size-distribution of hop holdings, Westerway-Ellendale region, 1958




(b) New Norfolk-Lachlan-Molesworth region, 1958

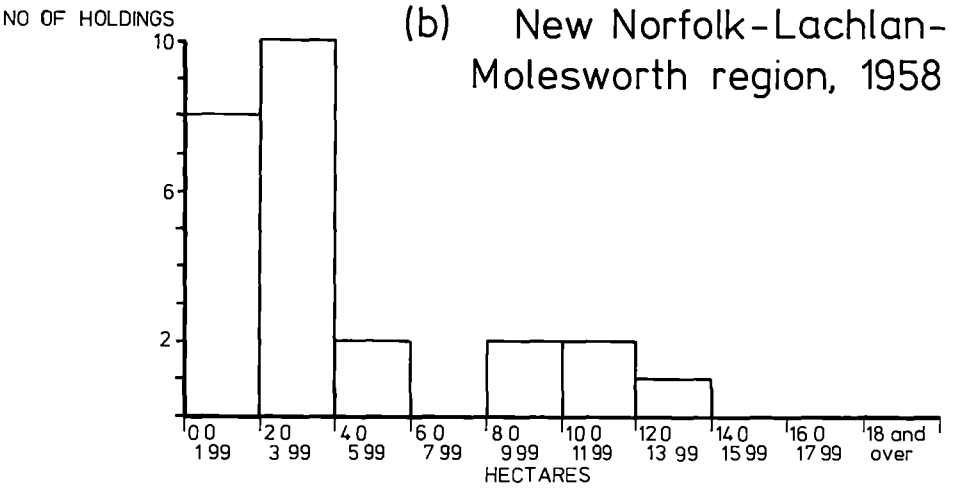



Figure II.6

SOURCE LANDS DEPT RECORDS

hectares in the former and 99.25 hectares in the latter region. Westerway-Ellendale however, had 41 growers compared with only 25 in the more southerly region, mean bearing area varying accordingly from 2.12 hectares to 3.97 hectares.

Apart from the contrasts in size of holdings between the three Derwent Valley regions, it is significant that during the period of expansion of total planted area area from 1935 to 1960, the core region again reveals the characteristic stability referred to in the earlier periods. Although valuation records for the core area are not available until 1952, the number of growers in the region remained constant from 1935 to 1952 at 17, and rose to only 19 by the 1957-58 crop year. Two leading growers in the region, when interviewed could not recall any hop farm in the locality which ceased production between 1935 and 1952; some farms changed hands but all continued to produce hops during the period. The area under hops varied only marginally from 1952 to 1958 in the core region, declining from 286.96 hectares to 285.82 hectares and was at virtually the same level for the next decade as well. In contrast to the core area, both peripheral Derwent Valley regions reveal changes in bearing area and grower numbers between 1935 and 1960 which reflect the observations made by Harvey (1963) in relation to periods of growth within the Kentish hop industry; expansion occurred in areas peripheral to the core and in more distant localities rather than in the core region itself.

In the 1934-35 crop year there were 32 growers listed in the New Norfolk-Lachlan-Molesworth region and 30 in the Westerway-Ellendale region (Tasmanian Postal Directory, 1935). By 1945 both areas had lost growers and bearing area largely because of the shortage of seasonal labour for harvesting during the war, but the

greater reduction had occurred in the Westerway-Ellendale region. The seasonal labour that was available during the war was able to find longer-term work on the larger farms which had more varieties of hops with longer harvesting periods; small farms usually had only one or two types of hops and had, therefore, a more restricted season. The Westerway-Ellendale locality, in addition to being distant from the core region was also considered further from Hobart than was the New Norfolk-Lachlan-Molesworth region; much of the seasonal labour originated in Hobart's northern suburbs, and if work was available closer to home this would have a bearing on their choice of work place. Further evidence of this phenomenon is seen in the fact that post-war recovery was also more rapid in the Westerway-Ellendale region, so that by 1958 it had 41 growers compared with the 25 in the New Norfolk-Lachlan-Molesworth region. The increase in planted and bearing area was also more rapid between 1954 and 1960 than was the case further south, but the more southerly region seems to have retained at least a slight edge in terms of planted area.

It is apparent, therefore, that there is a number of factors of an external nature, such as environmental considerations, as well as considerations of internal economic structure that account for the difference in overall size of units and rates of change in both grower numbers and planted area between the two peripheral regions in the Derwent Valley. These will be examined in more detail in Chapter IV where more recent data are more helpful to the analysis.

A second aspect of spatial significance during the period from 1935 to 1960 is that it spans approximately the only extensive period of hop production in Tasmania in which production has been

confined to the south of the state. Until the 1931-32 crop year hops were still being grown at Westbury in the north, but the Great Depression essentially represents the culmination of the first century of the industry in the state which saw the gradual concentration of production to the Derwent and nearby localities. As late as 1921 for example, a fairly substantial enterprise of 8.2 hectares of hops was in production at Strahan on the west coast; it was of very short-lived duration however, presumably due to the unfavourable climate. It was not until exactly 30 years after the last hops were grown at Westbury in the north that part of the state's hops again came from the north in 1961-62; this time from the Scottsdale municipality. The initial establishment at Scottsdale had, of course, been undertaken during the late 1950's.

The contraction of planted area and concentration of production towards the core area in the early 1930's having occurred as a result of differences in the degree to which the various regions were able to cope with changes in both internal and external economic conditions, it may reasonably have been expected that sometime during the extended period of expansion that followed there would have arisen new hop acreage in new localities more distant from the core area. Pearce (1976) has shown that both before the 1930's depression, and subsequently, the Australian government had been unwilling to control the area of hop production, preferring to regulate imports by a tariff, and after 1945 by an agreement with brewers that they would not import more than 15% of requirements without taking up any domestic surplus. This meant that regulation had come through the system of hop factoring; principally through H.Jones and Co.

Having long recognized the dangers of over-production, the larger growers and factors had managed to ensure that production was always below demand so that brewers were importing to make up the shortfall. However, it was apparently that a shortfall existed, at least in most years, that hops were seen as an attractive proposition by the two initial producers in the Scottsdale region. Examination of Table II.9 indicates the extent of shortfall in production for the preceding decade, although it will be noted that there is a steady narrowing of the gap between production and consumption during this period.

The 1935 - 1960 period also witnessed expansion of hop-grounds at southern localities beyond the confines of the Derwent Valley. These areas include Ranelagh on the Huon River, Margate and Kingston to the south of Hobart (see Map II.7). An indication of the size of the enterprises in these localities is gained from the fact that at Ranelagh and Kingston (Map II.7) one grower in each case operated the hopground shown; these insets are therefore maps of individual hop enterprises.

The Tariff Board enquiry of 1945 was important in that it regulated the importation of hops by brewers, thus affording a measure of protection to producers (Tariff Board, 1945), but it also set down conditions of employment in the industry, including wages. The effect, far from assisting in relative terms the small producer who provided most of his own labour, was to hasten the trend towards mechanical harvesting. The first hop-picking machine was tried in Tasmania as early as 1922 (Moore, 1977), and satisfactory mechanical harvesting was in operation at Bushy Park in 1950. However, the thick bines of Tasmanian hops proved a problem that was not fully resolved until the early 1960's so

TABLE II.9

HOPS: PRODUCTION AND DISPOSAL, AUSTRALIA - 1952 - 1961

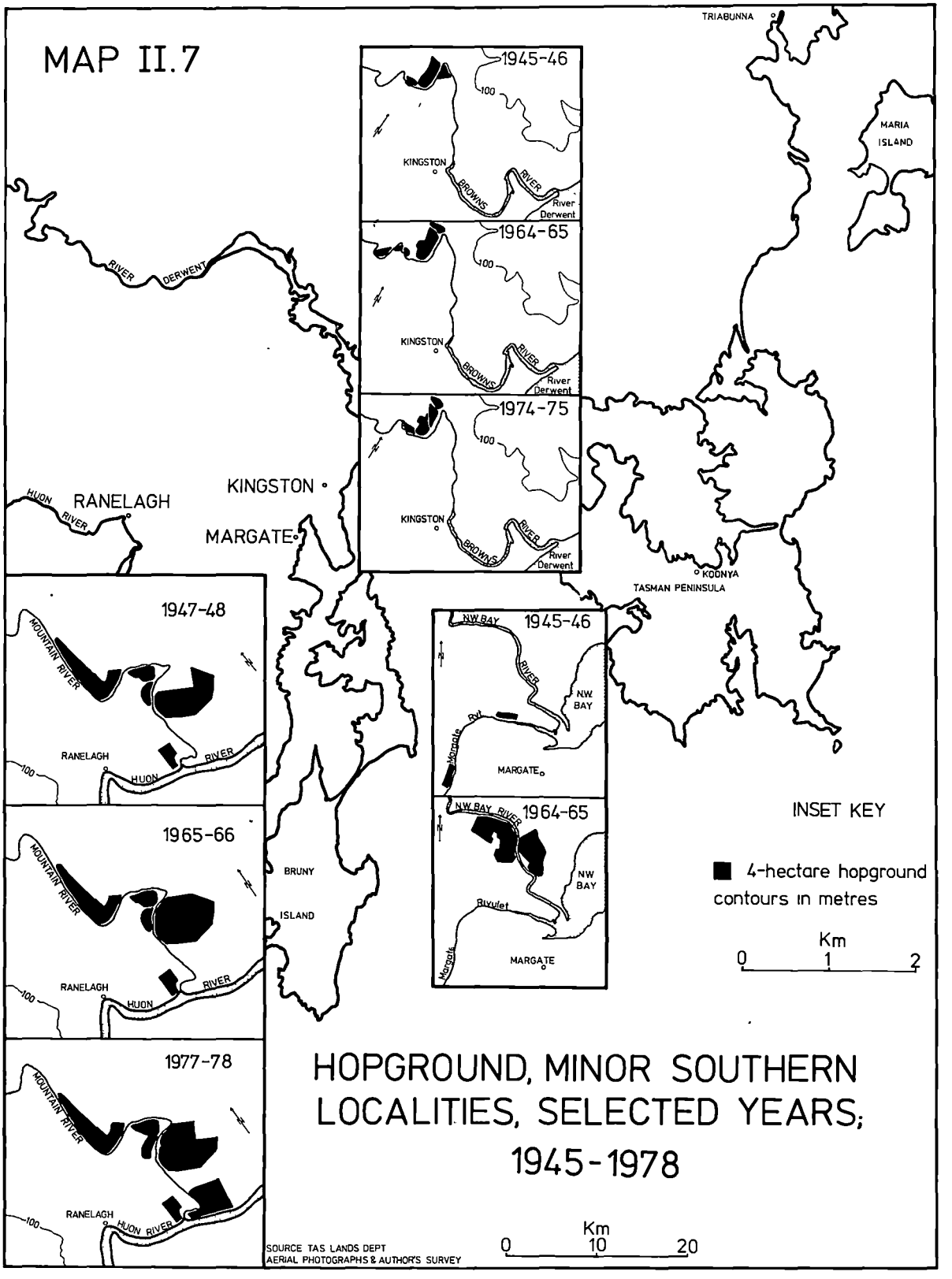
(Quantities are expressed as dry weight)

| Year | Production (a) | | Imports | Net Available Supplies (b) | Quantity Used in Breweries |
|---|---|---|---|---|---|
| | Quantity | Gross Value | | | |
| | '000 Lb. | '000 | '000Lb | '000Lb. | '000Lb. |
| 1951-52 | 2,006 | 517 | 2,754 | 4,760 | 4,257 |
| 1952-53 | 3,597 | 1,021 | 1,401 | 4,998 | 4,575 |
| 1953-54 | 2,763 | 802 | 1,644 | 4,407 | 4,875 |
| 1954-55 | 3,816 | 1,105 | 1,155 | 4,971 | 4,813 |
| 1955-56 | 3,850 | 1,102 | 1,891 | 5,741 | 4,887 |
| 1956-57 | 2,826 | 857 | 344 | 3,170 | 4,508 |
| 1957-58 | 3,695 | 1,137 | 504 | 4,199 | 4,409 |
| 1958-59 | 4,088 | 1,273 | 949 | 5,037 | 4,317 |
| 1959-60 | 3,560 | 1,159 | - | 3,560 | 4,520 |
| 1960-61 | 3,707 | 1,080 | 111 | 3,818 | 4,482 |

(a) Excludes small quantities produced in Western Australia, details of which are confidential.

(b) Excludes small quantities of hop extracts.

Source: C.B.C.S. (1961).


MAP II.7
TRIABUNNA
MARIA ISLAND
1945-46
1964-65
1974-75
KINGSTON
BROWNS RIVER
River Derwent
RIVER DERWENT
HUON RIVER
RANELAGH
KINGSTON
MARGATE
KOONYA
TASMAN PENINSULA
1947-48
1965-66
1977-78
MOUNTAIN RIVER
RANELAGH
HUON RIVER
100
NW BAY
NW BAY RIVER
NW BAY
Rivulet
MARGATE
BRUNY ISLAND
INSET KEY
4-hectare hopground
contours in metres
Km
0 1 2
HOPGROUND, MINOR SOUTHERN LOCALITIES, SELECTED YEARS; 1945-1978
Km
0 10 20
SOURCE TAS LANDS DEPT
AERIAL PHOTOGRAPHS & AUTHOR'S SURVEY

that most hops were still being hand-picked by the end of the 1950's. Nevertheless, it was clear that successful adaptation of German, British and American hop harvesters would revolutionize the industry so that by the late 1950's initial planning for mechanical harvesters was underway on larger holdings in the Derwent, and the mechanical harvester had made possible the entry of the growers in the Scottsdale region into hop production, as these farmers intended to operate large acreages, (Davey, 1977). The north-eastern growers also developed new, larger, oil-fired kilns which further improved the uniformity of the product.

Although hand-picking of hops continued in the Derwent Valley until the early 1970's, rising wage costs had, by 1960, led to a situation where there were essentially two types of growers. The first was the relatively few large producers who had their own kilns and were skilled in all phases of the industry, and who were cognisant of both internal structural and operational costs and external economic conditions likely to bring about change in the industry as a whole and in the internal operation of their farm enterprises. The second category, the majority of smaller producers, by contrast, had become mere links in a chain of production which included centralized processing of their crop. Smaller producers often knew little or nothing of the external conditions affecting their industry and were usually represented on the Hop Producers' Association by the larger producers. The hop factors, particularly H. Jones and Co., had farm consultants who were virtually travelling managers; they visited smaller growers frequently and told them when to carry out each stage of the annual production cycle. Decision-making was almost entirely removed from the smaller grower's responsibility. Thus while

the larger grower was able to make the change to mechanical harvesting as he did in the 1960's, thereby producing cost savings in his internal operation, the smaller grower was becoming almost entirely dependent on the hop factors. This situation had its advantages in terms of quality control and control of pests and diseases but it was bound to make the small producer vulnerable in times of over-production; if the factor refused to buy his hops and perhaps called for payment of outstanding debts, he had little alternative but to cease production.

Because of the long history of price fluctuations which resulted from inelastic demand - fluctuations which caused uncertainty for growers and consumers - the Tariff Board Report resulted in regulation of prices after 1945. The price of hops was fixed within fairly narrow limits, with variation for variety and quality, and increases had to be requested by producer organizations on the basis of cost increases, (Tariff Board, 1945). The result was that growers had at least some idea of the long-term price outlook so long as Australia was not producing beyond her requirements. Larger producers therefore made long-run decisions to expand and to adopt mechanized harvesters. Small producers who sold their crop green were able to make a reasonable return so long as their yields were maximized and they were prepared to substitute their own and their family's labour for hired labour as much as possible.

The rapid inflation of the early 1950's saw an equally rapid rise in hop prices from 2/4d per lb. to 5s per lb. in three years from 1949, but thereafter although increasing to 6/10d in 1966 (Shield and Hibbard, 1966) the rise did not cover increased costs in the industry. Although the Index of farm costs for all

farms in Australia rose only 32.9% from 1952 to 1966 (B.A.E., 1978) while the price paid for hops rose some 36.9% during the same period, costs on hop farms rose substantially more during the period due to industry-wide replanting to Ringwood Specials and consequent losses of production while the new plants were maturing (Grower survey, 1977). It is of possible significance also that during the same period the Consumer Price Index for Hobart showed an increase in general prices of 40% (C.B.C.S., 1966a; 1968a).

The 1950's then, began with very high returns to growers, thereby attracting new producers to the industry; however, most of these growers were in the small category and as has been demonstrated, the majority were not in a position to benefit from the scale economies made possible by the advent of mechanical harvesting and other improvements such as new oil-fired kilns. The reduced long-term costs to the industry as a whole resulting from the substitution of capital for labour resulted in a lower rate of price increase for the commodity than would otherwise have been the case, yet the cost reductions were not shared equally between producers; costs were not reduced for the small family-operated farm which had relied on family labour as an integral part of the cost structure of the farm unit.

As the 1952 prices paid for hops were high enough for small producers to make an adequate living with satisfactory return to capital, and this is confirmed by the author's survey of former growers, it is reasonable to assume that all but the most inefficient of these producers could have survived a small decline in relative income terms. This view is sustained by the survival of a very high proportion of small producers who remained

in the industry until the early 1970's, even replanting to a second new hop variety - the Pride of Ringwood - in the belief that theirs was an enterprise which offered a secure future. However, it was precisely the development of the new hop varieties that was to ensure the demise of the small producer; the new varieties had increased brewing value thereby leading to over-supply, and they had the effect of reducing the harvesting period so that mechanical harvesting was a virtual necessity.

There was a number of reasons for the search for new hop varieties. Principally, the brewing trade had begun the search in order to find a hop with better brewing value than the varieties grown in the 1950's in Victoria and Tasmania. The bittering substances in the hop are principally the alpha acids although there are other essential oils which are important also (Verzele, 1971). Apart from endeavouring to increase the percentage of alpha acids in the hop, the research was aimed at producing varieties of hops more suited to mechanical harvesting than were the varieties grown in Tasmania and Victoria, and at the same time trying to reduce the susceptibility of the plant to disease. Ironically, the Ringwood Special which was quite widely planted in Tasmania and Victoria in the early 1960's turned out to be so susceptible to diseases that after trials in Britain in 1968 it was under consideration as the 'inoculator' variety in epidemiological studies, (Geard, 1968) at Wye College hop research centre.

Pearce (1976) has shown that the result of the Victorian research was that it gave a tremendous stimulus to the industry in that state, leading to a three-fold increase in planted area to 1955 when there were 155 hectares under cultivation, and

a further increase to 256 hectares by 1965. While the ultimate effects of the new developments in the industry and of the increased production in Victoria were not to be felt in Tasmania until a decade or more after 1960, the ensuing period from 1960 until the early 1970's was to be a period of markedly varied response, both in terms of size and internal structure of individual farm enterprises, and in terms of the regional distribution of that productive enterprise.

From 1935 to 1960 however the general expansion of hop production in the south of the state of Tasmania may be viewed as an expansion of the extensive margins of production, reflecting as it does that the industry offered a worthwhile livelihood for both small family farmers and larger enterprises; the changes that were to follow could hardly have been fully perceived or appreciated any earlier than 1960.

# CHAPTER III

## THE CONTEMPORARY PERIOD

### Introduction

The choice of 1960 as the beginning of the contemporary period in the hop industry of Tasmania relates to the three central concerns of this chapter. First is the relocation of a substantial portion of the industry to the Scottsdale region. This shift of productive enterprise involved newcomers to the industry, new techniques and a degree of efficiency that was not characteristic in the south of the state. In turn, competition from the north-east was to hasten the structural adjustment and general modernization of the industry in the south - the second of the central concerns of this chapter. The third concern of the chapter derives from the earlier two in that the general expansion of the industry which was the initial outcome of the introduction of improved technology was to lead inevitably to oversupply of the market and consequent contraction of the extensive margins of production. These three concerns will be examined separately in ensuing sections, but the interrelatedness of all three must be seen as essential to an explanation of the industry in the present period. It is the view of the writer that the contemporary period in the industry has its origins at or immediately prior to 1960, and that to attempt a cause and effect explanation of the industry after this date in the chronological sense that was appropriate to the earlier period is to ignore the complex interrelatedness of events in the last two decades.

The emergence of the Scottsdale region

It is only after detailed interviews with hop producers and former growers that important events that have had dramatic effects on the spatial distribution of the industry can be adequately comprehended in the context of the decision-making environment of the time that they occurred. The shift of production to the north-east of Tasmania is a case in point. The reasons for the shift, and indeed the scale of the industry in the new location receive scant attention from Pearce (1976), and the Commonwealth Bureau of Census and Statistics has published conflicting information as to whether production began in the region in the 1962 or 1963 crop-year (C.B.C.S., 1962; 1968b). The problem of using a macro-statistical approach is further highlighted by the 1964 industry report of the C.B.C.S. which comments on the substantial fall in yield in that crop year by simply stating that "the substantial decrease in production was attributable to the big fall in the average yield per acre from 1971 lb. in 1963 to 1093 lb. in 1964". No further comment is added by way of explanation for the substantial drop in yield, which was in fact due to unseasonal winds in that year (Raynor, 1977).

A relatively general interpretation of the shift of production to the north-east is that it represented a natural response of growers in the new locality who took up hop production in a period of good prices and of general expansion of the extensive margins of production for the crop. There had, after all, been expansion of the industry in the mid-1950's at Ranelagh on the Huon River and Margate and Kingston in the Channel area south of Hobart and as far north as Ouse on the River Derwent. With the

introduction of the Ringwood Specials in the early 1960's, at least one new locality, Koonya on the Tasman Peninsula, had commenced hop production; Scottsdale, however, falls into a somewhat different category for a number of reasons.

The region is located over 250 kilometers from other hop producing localities in the state, and apart from a very few small hopgrounds in earlier years had no history of hop production. Less than one and a half decades after commencing production, the north-east of the state had exactly half of all growers in the state and actually produced more than half the total of the state's output of hops (A.B.S., 1976b). This relocation of the industry must be seen then as much more than a mere expansion of the extensive margins of production. In fact, events subsequent to its emergence have proven that regions within the Derwent Valley formerly able to survive periods of over-production within the industry as in the 1930's, by reduced acreage and grower numbers, have been virtually eliminated as hop-producing regions in the current over-supply situation. It has not been the north-east that has substantially reduced planted area, but regions much closer to the core region, and the question arises as to whether the core region itself is ultimately under threat from the new locality.

The reason for the relocation of production in the north-east was also quite different to reasons affecting expansion at the extensive margins of production. It has been shown that the period from 1935 to 1960 was a period of expansion in areas of the Derwent Valley and in peripheral localities. The period of trial and error in more distant parts of the state had

concluded, with the dominance of the middle-Derwent being unchallenged for a quarter of a century. Expansion within the south of the state was almost always with the knowledge that the market existed and that the hop factor was willing to buy. The north-east differed in that a Victorian factor had contracts for overseas sales and growers in the Scottsdale area commenced production in the belief that there existed a permanent overseas demand for their crop.

A more significant difference between the north-east and the south of the state relates to the farming background of the new region. Unlike the south of the state where, with the exception of hop production and orcharding, cash-crop enterprises have always been rather haphazard and poorly organized in the marketing sense, the Scottsdale region had a tradition of highly efficient vegetable production with related processing plants. Farmers in the area tended to be astute business managers with a knowledge of crops and the economics of production. It was only in the north-east of the state that the author's survey found significant numbers of producers who had specific tertiary training in agriculture and related fields. Apart from a small number of individual producers, only the factor-run estates in the south were in the hands of managers with similar tertiary-level training. This point is also supported by the Makeham survey of 1970. During the 1950's there was reduction of the vegetable canning industry in the Scottsdale region, mainly because of competition from localities on the north west coast and on the mainland. To a large extent the Tasmanian Department of Agriculture was responsible for the search for an alternative cash crop enter-

prise for the region (Davies, 1977). The apparent shortfall in domestic production of hops (see Table II.9) may well have been an influence at the time but it seems also that there was a general desire to avoid Tasmania becoming the second ranking hop producer after Victoria that prompted active government encouragement to the Scottsdale producers.

The first two growers in the north-east obtained several varieties of hop sets from Kingston and Ouse in the south, but with one exception, the Colgate Lates, the yields were disappointing. It is not clear why this was so, but micro-climatic factors and soil types may have been unfavourable (Davey, 1977). With the majority of crops demanding high initial expenditure, early yield failures would perhaps threaten disaster, and Scottsdale was no exception. But the enthusiasm and energy of the two initial producers was responsible for a second attempt, this time with the Victorian Ringwood Specials in 1962. Results were very encouraging and thereafter the region became firmly established in hop production with new growers entering the industry. The superior Pride of Ringwood variety was introduced later in the decade and also thrived in this locality. In fact, this region was the first to replant entirely with the Pride of Ringwood variety (see Plate III.1), having completed the changeover by 1971 (C.B.C.S., 1971). Broad statistics published by the C.B.C.S./A.B.S. since 1971 have not distinguished between bearing and non-bearing acreage so that certain apparent results appear misleading, as will be detailed in Chapter IV. Despite this, it is clear that the actual yield per hectare of bearing area has been the highest or

Plate III.1
Hop varieties a) Golden Cluster b) Pride of Ringwood c) Ringwood Specials.
With permission, Tasmanian Department of Agriculture.

second only to the New Norfolk municipality in every year since 1971, (C.B.C.S./A.B.S., annual industry statistics 1971 to 1977). This was particularly evident in the very high yields of 1974 as indicated in Table III.1.

Unfortunately for smaller hop producers in the south of the state, the export market which had provided the initial stimulus for production in the Scottsdale region had not been sustained by the 1970's, due mainly to increased production in Europe, and growers in the Scottsdale region had naturally begun selling on the domestic market. In the years of domestic short-fall in Australia prior to 1974, this seemed a desirable course of action. Inevitably however, even without the effective increase in yield brought about by new varieties and a lower hopping rate in beer production, the entry of the Scottsdale growers into the Australian market, along with increased production from a higher Victorian acreage, was to bring about a repetition of the over-supply situation that had occurred in the early 1930's.

The crisis year was the 1973-74 crop year in which the total area in the state under hops reached an all-time record of 703 hectares (A.B.S., 1974) and with excellent seasonal conditions a record crop was produced. Total production was actually 35% above the 1972-73 level, and although the A.B.S. states that the yield of 2,772kg. per hectare "is extremely high and is nearly 18% above the 1972-73 level" (A.B.S., 1974), there are again reasons for doubting the accuracy of these figures. It appears from the data (Table III.1) that the planted area in the north-east increased from 166 hectares in 1972-73 to 216 hectares by 1973-74. The difference, of 50 hectares, would

TABLE III.1

GROWER NUMBERS, PLANTED AREA AND YIELD, 1971 - 1974

| Year | No. of Growers | | Hectares | | Yield (Kg./Hec.) | |
|---|---|---|---|---|---|---|
| | N.E. | State | N.E. | State | N.E. | State |
| 1970-71 | 5 | 81 | 40 | 530 | 2,348 | 2,389 |
| 1971-72 | n.a. | 76 | 84 | 539(a) | n.a. | 2,149 |
| 1972-73 | 12 | 74 | 166 | 616(a) | 3,156(b) | 2,355 |
| 1973-74 | 19 | 76 | 216 | 703(a) | 3,689(b) | 2,772 |

(a) includes non-bearing area

(b) adjusted for probable effective bearing area

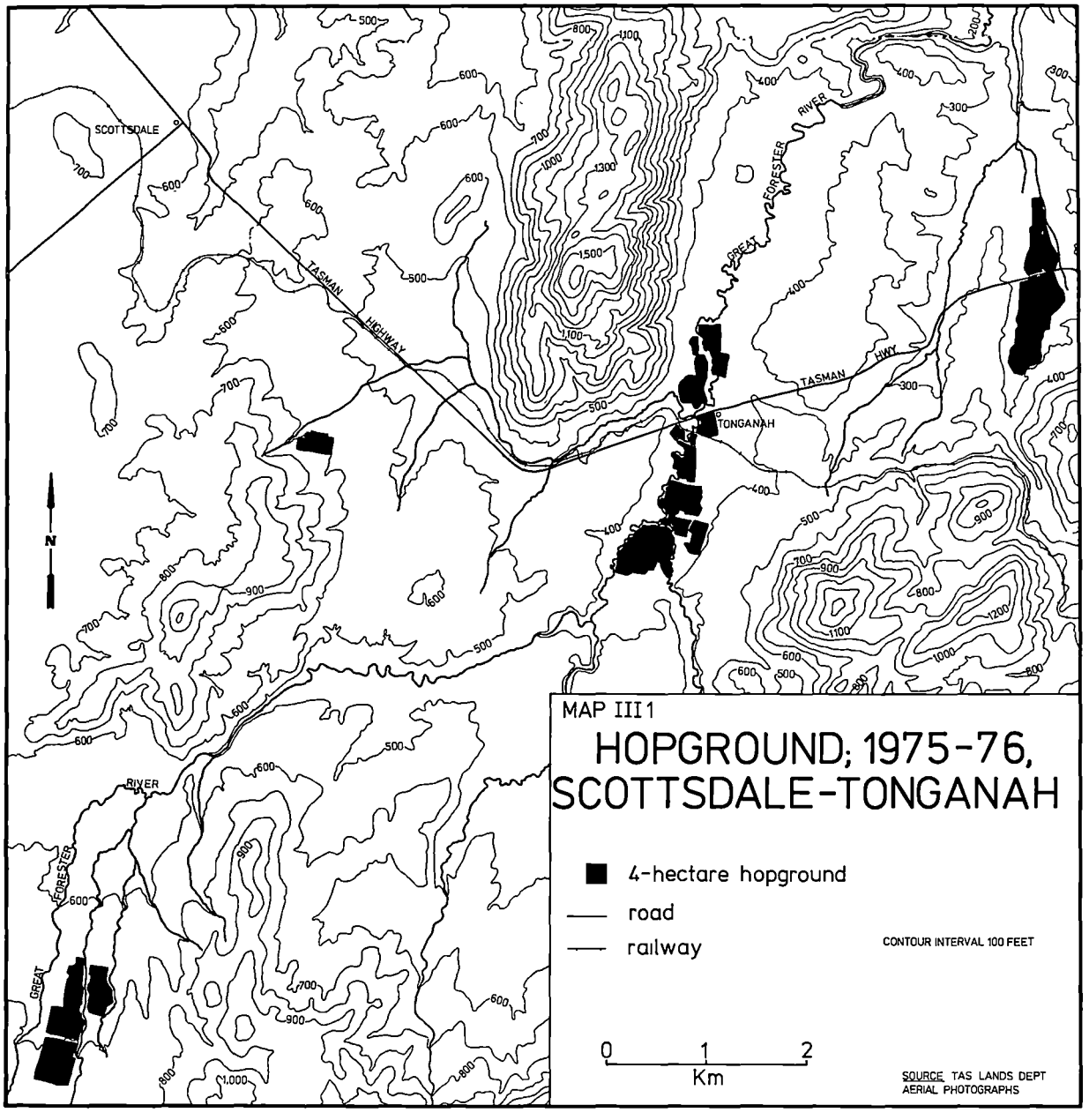
Source: C.B.C.S. 1971; 1972; 1973; A.B.S. 1974.

therefore have been non-bearing area. The effective bearing area of the state must therefore be reduced to no more than 653 hectares, which means that the 1973-74 yield was in fact at least 2985kg. per hectare. This would have been an excellent yield under any circumstances, representing 23.73 cwt. under the earlier measurement system. However, by 1973-74 the Scottsdale producers were using a seedless Pride of Ringwood in which the elimination of the male seed reduces the weight of the yield by about 20% (Davey, 1978), with a consequent increase in the essential lupulin per unit of dried hops. Effectively then, the 1973-74 yield must be increased by this factor for comparison with earlier yields, but there is an even more important element to consider in discussion of yields at this point in time; namely the higher alpha acid content of the Pride of Ringwood hop variety. Earlier hop varieties ranged from about 2% to about 6% (Makeham, 1970) but most would have averaged about 3% - 4% alpha acid. The Pride of Ringwood averages around 10% alpha acid by comparison, representing an effective 2.5-fold increase in yield. When these factors are taken together, it will readily be seen that if orderly production and marketing was to have been maintained within the industry, the need by the mid-1960's was for a reduction in planted area rather than the scale of increased production represented by the new plantings in the Scottsdale region.

A further point to note with regard to the published data for the Scottsdale region pertains to the 1972-73 crop year in which actual planted area in hops increased from 84 hectares to 166 hectares or by almost 100%. Again because of the method

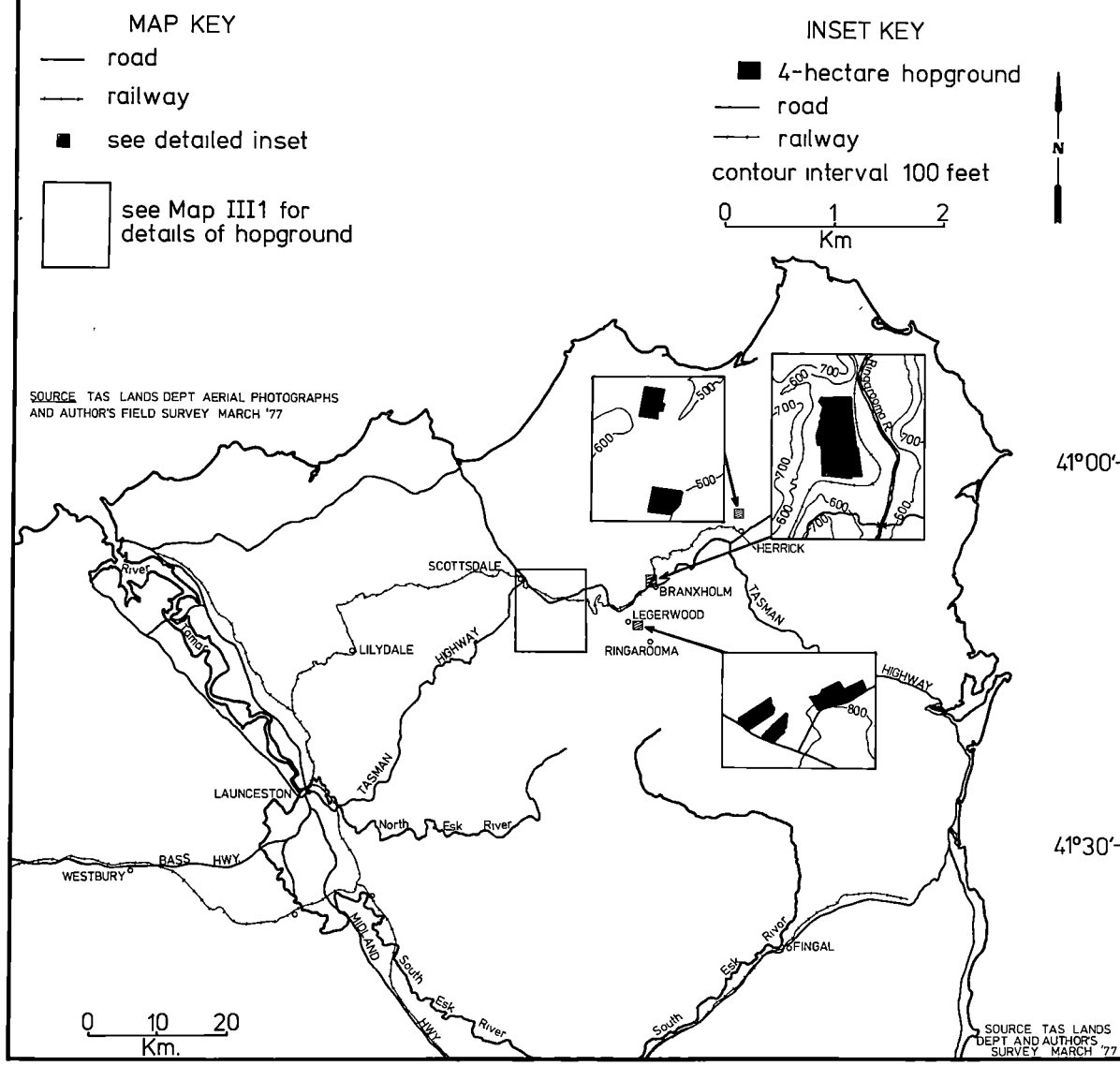
of combining bearing and non-bearing area in calculating the yield, the figure for the Scottsdale region was determined on the basis of 166 hectares instead of the bearing area of only 84 hectares. Therefore, the published yield figure of 2327kg. per hectare appears to be below the state average of 2355kg. per hectare. In fact, the actual yield was more correctly 3156kg. per hectare or over 25 cwt. per acre under the earlier measurement system. In 1975-76 the Scottsdale area actually produced 53% of the state's total hops on less than 44% of the state's total planted area (A.B.S., 1976b).

Undoubtedly the high yields of the modern phase of hop production in the Scottsdale area have influenced expansion of production in the region, but it seems from the relatively widespread distribution of production that other considerations are involved. Hops are now grown in a zone which stretches from Springfield to the south of Scottsdale (see Map III.1) through Tonganah, Branxholm, Ledgerwood and beyond Herrick some 45 kilometers north-east of Scottsdale (see Map III.2). On Map III.1 and the insets on Map III.2 relief appears to be more prominent than on the Derwent Valley hop production maps; however Lands Department mapping of the north-east involves measurement in feet. The Derwent Valley maps employ 100-metre contours and the maps for the north-east employ 100-feet contours; in fact local relief is relatively similar between the Scottsdale region and parts of the Derwent Valley. Individual holdings in the region were larger than most of those in the south of the state in 1973-74 when planted area averaged 11.37 hectares per grower while in the south, despite the very large estates in the Bushy Park


SCOTTSDALE
TASMAN HIGHWAY
TASMAN HWY
TONGANAH
GREAT FORESTER RIVER
GREAT FORESTER RIVER
N
MAP III 1
HOPGROUND; 1975-76, SCOTTSDALE-TONGANAH
4-hectare hopground
road
railway
CONTOUR INTERVAL 100 FEET
0 1 2
Km
SOURCE TAS LANDS DEPT AERIAL PHOTOGRAPHS

MAP III 2

# HOPGROUND, MINOR NORTH-EASTERN LOCALITIES; 1976-77



region mean planted area per grower was only 8.54 hectares, (A.B.S., 1974). By 1976-77 the situation had reversed somewhat with the loss of over 40 growers in the south, but mean size of planted area had increased to 18.75 hectares in the north-east, compared with 25.86 hectares in the south. It must be remembered that the majority of the larger holdings in the south either belong to or are leased by one dominant company and are not therefore individually owned as are the properties in the north-east. It is clear, therefore, that producers in the north-east have well understood the unit-cost savings which accrue from increased factor inputs. From the start, the larger growers in the region have employed high capital inputs in the form of large oil-fired kilns and the larger mechanical harvesters thereby minimizing unit production costs. These growers have thus been able to survive in the face of low export prices and to gain substantially at the expense of southern producers from sales at considerably higher prices on the domestic market. This substantiates the earlier point that the growers in this area tend to have had more experience with organized production of cash crops than have their counterparts in the south of the state.

The north-east region has traditionally been noted for considerable vegetable production, particularly the production of peas for canning and export. Potatoes, onions, beans, carrots and vegetable seeds have all been important crops and more recent even than the adoption of hops in the region has been considerable involvement in oil poppy production for processing into codeine. The south of the state had little experience with either the variety or quantity of such crops for processing for export; the regions which produced smallfruits for jam were well known for the habit of pickers who added rocks and water to their harvest to increase the picking weight upon which they were paid. Orcharding,

a slowly-dying crop activity in Tasmania, is the only export-oriented crop activity apart from hops in which the farmers in the south have ever been engaged on a substantial scale with the possible exception of wheat production in the nineteenth century when part of southern Tasmania was known as 'the granary' of Australia. The argument is strengthened when one considers that it was the north-eastern growers who pioneered the pelletizing of hops and developed a method of packaging the hops in a nitrogen-flushed plastic bag to reduce oxidation. The pelletizing process is conducted at a single, centrally located plant to which growers bring their dried hops. The capital inputs and research necessary to develop this system would not have been possible without the active grower participation through the Scottsdale Hop Producers' Association, and again it was the experience in cash cropping of the farmers in this district that enabled the necessary co-operation for such a venture to be successfully organized. Certain co-operation with the H.Jones and Co. Hop Research station at Bushy Park occurred in the early years of establishment in the north-east but the major information flow for these growers was generated from the Ringwood Hop Research station of the Carlton and United Brewery in Victoria and from overseas visits by leading producers in the region (Davey, 1977).

The south may well have endeavoured to keep up with the new approach of the north-eastern producers had several phenomena not tended to occur simultaneously. One was the gradual take-over of the larger hopground properties in the core region by the leading hop factor, H.Jones and Co. This process began in the late 1960's and was completed by 1977; there remains only one non-factor-owned large hop unit in the region in 1978. The second phenomenon was the claim made consistently by the Scottsdale producers during

the 1960's that they were producing exclusively for the export market - a claim soon proved false by the sale of their hops on the domestic Australian market in the early 1970's when the export demand declined. The third phenomenon was that many southern producers who went into debt in order to replant their hopgrounds with Ringwood Specials in the mid-1960's barely climbed out of this debt when they were again told to replant with the Pride of Ringwood variety in the early 1970's. They thus had little in the way of capital to allow for co-operative purchase of harvesters or building of more efficient kilns. Nor was their traditional source of finance - the factor, about to lend them large amounts of money when it was busy enlarging its own hop holdings in order to take advantage of economies of scale. Also, the expertise and experience of quite a number of larger growers in the south was now either unavailable to the industry due to its having been bought out, or it was centralized in management roles on factor-owned properties at the very time that it could have been pooled to enable survival of the more efficient and enthusiatic of the medium and small producers.

The fact that the Pride of Ringwood hop variety is well suited to the north-east of the state is fortunate for the growers in the region, but the earlier success with Ringwood Specials in the mid-1960's can be regarded as the culmination of a stage of trial and error or as the end of the first stage of a search process which saw the establishment of hops as a viable proposition for the region. In a sense, it was rather similar to the early establishment period in the Derwent Valley except that much more was known of the best methods of hop production in the Tasmanian environment. If the absence in the north-east of the type of

excellent river alluvium and particular climatic conditions of the Derwent Valley was the cause of the lack of success with the earlier varieties trialled, it was extremely fortunate that a suitable variety in the form of the Ringwood Special turned up at exactly the right moment to provide the necessary momentum for the fledgling industry. Certainly this hop variety has greater tolerance to varied growing conditions as does the Pride of Ringwood; both varieties grew extremely well in the different localities in which they were tried in the north-east (Davey, 1977). However, as pointed out in Chapter I, the association between hops and fertile alluvium of the River Derwent is at least partly due to reasons other than the actual fertility of the soil; elevation of the land beyond the floodplains precluded gravity-fed irrigation possibilities for example.

Following the success with the Ringwood Specials, the rapid increase in grower numbers and their spread into surrounding localities exhibits a characteristic contagious diffusion (Abler, Adams & Gould, 1971). The two pioneer growers managed to convince numbers of their near neighbours that the heavy capital input demanded by hop production would be justified. Grower numbers increased slowly at first to only five in 1969-70, all of whom were in the Scottsdale municipality. By 1972-73 there were 12 growers, including some in the Ringarooma municipality, and by 1973-74 the number was 19 including at least one in the Lilydale municipality. Subsequently, the number has declined in line with the general recession in the industry caused by over-production (C.B.C.S./A.B.S., annual industry statistics, 1969-1978).

The fact that the conditions under which hops were grown by different producers in the region varied markedly as to soil

type, slope, elevation, drainage characteristics and micro-climates suggests that it was more than merely the natural environment that led to the region's emergence to prominence in hop production. It could as well have been river valleys or krasnozem soil regions of the north-west of Tasmania that succeeded in hops during the same period had it not been for the drive and enthusiasm of the initial producers near Scottsdale.

As has been the case in the Derwent Valley over several recessions in the industry, it is already evident that the Scottsdale region has passed through a period of expansion and subsequent contraction of the extensive margin of production, with the 1977-78 limits to production being again confined to two municipalities and the majority of planted area lying within a few kilometres of the larger holdings and pelletizing plant in the Tonganah area. Maximum planted area of 228 hectares in the north-east was attained in 1974-75 when there were still 17 growers in the region. The contraction of the extensive margins of production that has been so marked in the south of the state since 1973-74 has affected only the smaller producers in the north-east, so that by 1976-77 the planted area was still 225 hectares, although the grower number was reduced to 12 (A.B.S., 1977a).

It is evident that the north-east of the state has captured a substantial share of what could be considered core production area within the last decade. In 1973-74, before the disastrous over-production within the industry had had its dramatic effect on grower numbers and planted area, the New Norfolk municipality had 54.1% of the planted area of the state. Unlike previous periods of contraction when this municipality

has gained an increased percentage of planted area, the figure has declined in each year since 1973-74 so that it was 51.1% in 1976-77 and less than 50% in 1977-78. By contrast, the north-east had only 30.7% of the state's planted area in 1973-74 but increased its share to 38.3% in 1976-77 and over 40% by 1977-78.

Expansion and modernization, 1960 - 1972

The 12 years from 1960 encompass a period of technological advancement and structural adjustment in the Tasmanian hop industry that was to transform both its regional distribution and its operational attributes. The relocation of a substantial proprtion of the industry to the north-east of the state during the period has been discussed in the preceding section, but there were also substantial shifts in the location of production within the Derwent Valley towards the end of the period in question and in the years immediately following. The major portion of the explanation for such changes is attributable to the substantial technological changes and related structural adjustments within the industry as a whole and at the level of the individual farm.

In 1960, the production of hops offered a good livelihood for efficient farmers with as few as one or two hectares of hopground; virtually all hops were harvested by hand - only one larger farm had a mechanical harvester which it had operated for over a decade; and domestic prices and demand for the wide variety of hops produced were assured from the under-supplied Australian market. By 1971-72, although a few smaller growers remained, no grower with less than two hectares in hops could hope to survive very long as evidenced by the decline in grower numbers of 32% in the previous five years. Mechanical harvesters

had replaced hand picking on virtually 100% of farms - smaller growers took their unpicked bines to centrally-located harvesters; and brewers were demanding the high-alpha Pride of Ringwood hop, thereby substantially reducing the level of domestic demand. It may be argued that this pattern of structural transformation is typical of much of the rural industry of Australia and indeed of the developed world; what makes it more devastating in the case of the hop industry is the high-cost structure of the industry even before the advent of mechanization, and the price inelasticity of demand for the product. Although since 1945 there had been price agreement within the industry, this control only worked in a situation involving market shortfall; over-production inevitably meant lack of sales for many producers who normally sold on the domestic market and price collapse for export hops. Coincidentally, 1973-74 was to see a substantial collapse in the level of export demand, thus further adding to effective domestic supplies.

As has been previously indicated, the impetus for the development of new hop varieties came from brewers; specifically, from the Carlton and United Brewery Company of Victoria. Successive reductions in the hopping rate (quantity of hops per unit) for beer production had occurred throughout the earlier decades of the century (Makeham, 1970), but the development of the Pride of Ringwood variety had even more marked benefits for brewers who were able to reduce the quantity of hops required for an equivalent quantity of beer by a factor of at least two, and possibly three times. Specific values for the yield of alpha acids for each variety of hops produced in Tasmania are shown in Table III.2:

TABLE III.2

ALPHA ACID CONTENT OF TASMANIAN HOP VARIETIES

| | % |
|---|---|
| Pride of Ringwood | 9.2 |
| Ringwood Special | 5.0 |
| Golden Cluster | 5.0 |
| Golding/Fuggles | 4.4 |
| White Vine | 2.3 |
| Late Grape | 3.1 |
| "Straights" | 3.9 |

Note: Averages are based on a large number of samples of fresh hops analysed in the years 1965, 1966, 1967 and 1969 ex Carlton and United Breweries, Melbourne.

Source: Makeham, 1970, 40.

It can readily be seen that the Pride of Ringwood gives up to four times the alpha acid of the lower yielding hops and almost twice that of the Golden Cluster (see Plate III.1).

The immediate stimulus for the planting of the Pride of Ringwood in the Scottsdale region was the fact that the export price for hops was related to their alpha acid content and in the late 1960's producers in this region were still producing almost entirely for overseas markets. Once the brewing value of the new hop variety was fully realized by Australian brewers, however, they began to specify this variety in their orders; southern growers therefore had little choice but to replant with this variety. The domestic Australian price for hops has not at any time been directly related to their alpha acid content although growers still received a lower price for inferior quality hops (Ross, 1977). The effect was that growers still needed to produce as many tonnes of hops in order to maintain income levels and were thereby inadvertently oversupplying a formerly under-

supplied market. The dramatic increase in effective brewing value of hops produced from 1965 to 1970 is demonstrated in Figure III.1 where the alpha acid yield is seen to increase rapidly relative to a more gradual increase in the total weight of hops produced. It will be noted that Figure III.1 reflects total Australian alpha acid yield and production, and for the present purposes the analysis must be broadened to reflect the national supply and demand relativities.

Between 1959-60 and 1971-72 crop years, the trend in total Australian hop production was for a gradual increase with occasional poor yields, as in 1963-64 due to unseasonal weather conditions. The five-year average from 1960 was an annual production of 1543 tonnes, whereas in the five years to 1972 average annual production was 1928 tonnes or an increase of 24.9% (see Table III.3). By contrast, when the same method of analysis is applied to the Australian consumption by breweries over the same time period the results indicate a decline in consumption of 15.9% from 1985 tonnes in the first five years to 1670 tonnes in the last five years of the period. The graphed results of this relationship on an annual basis are shown in Figure III.2. From Table III.3 it can also be seen that the period from 1960 to 1972 spans the transformation of Australia from a net importer of hops to an exporter of the commodity but by 1972 there remained an apparent cumulative shortfall of production over consumption and export. A relative degree of optimism for the long-term viability of the industry apparently remained in 1972 when the majority of farmers in Tasmania were either changing to Pride of Ringwood hops or contemplating the change. A more careful analysis of the data as in Table III.3

# Australian hop production and alpha acid increase, 1965-1970

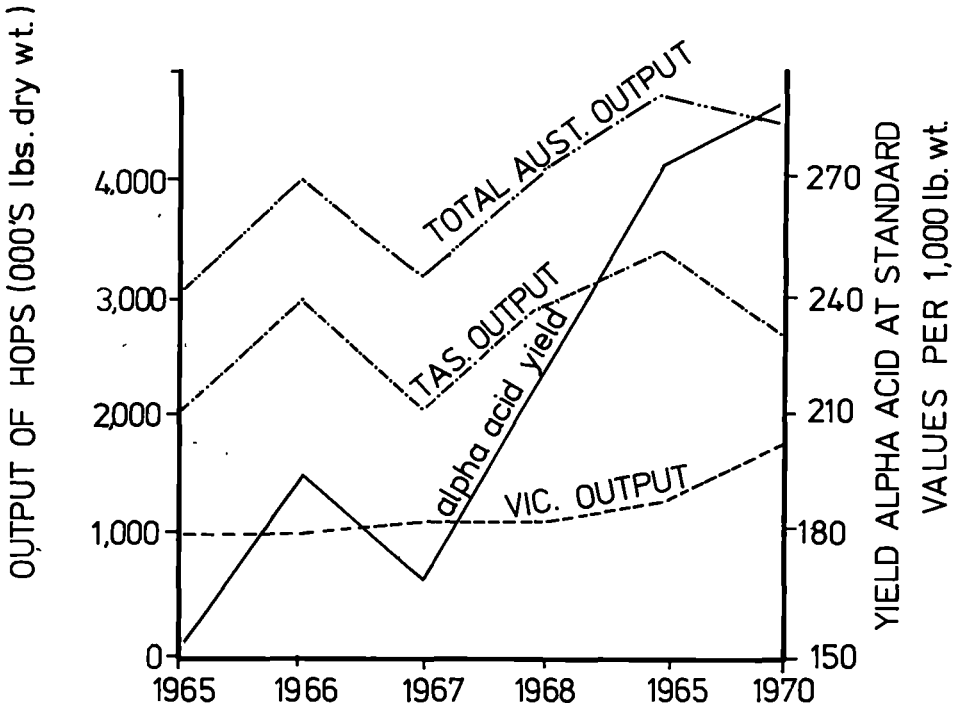



Figure III.1

SOURCE: MAKEHAM, (1970), 40.

TABLE III. 3

CHANGING IMPORT, EXPORT, SUPPLY AND DEMAND FOR HOPS IN AUSTRALIA 1960 - 1972

| Year | Australian Production (a) Tonnes | Hops used by Breweries in Australia (b) Tonnes | Surplus or Deficit Domestic Production Tonnes | Imports Cones and Lupulin (b) Tonnes | Exports Tonnes | Cumulative Deficit or Surplus since 1960 Tonnes |
|---|---|---|---|---|---|---|
| 1959-60 | 1,618 | 2,054 | - 436 | - | (c) | - 436 |
| 1960-61 | 1,685 | 2,037 | - 352 | 50 | (c) | - 738 |
| 1961-62 | 1,691 | 1,989 | - 298 | 284 | (c) | - 752 |
| 1962-63 | 1,712 | 1,958 | - 246 | 68 | (c) | - 930 |
| 1963-64 | 1,011 | 1,885 | - 874 | 27 | (c) | - 1777 |
| 1964-65 | 1,417 | 2,008 | - 591 | 484 | (c) | - 1884 |
| 1965-66 | 1,852 | 1,789 | 63 | 645 | (c) | - 1176 |
| 1966-67 | 1,469 | 1,585 | - 116 | 137 | (c) | - 1155 |
| 1967-68 | 1,867 | 1,549 | 318 | 69 | (c) | - 768 |
| 1968-69 | 2,172 | 1,731 | 441 | 76 | (c) | - 251 |
| 1969-70 | 2,048 | 1,755 | 293 | 18 | (c) | 60 |
| 1970-71 | 1,706 | 1,760 | - 54 | 18 | 491 | - 467 |
| 1971-72 | 1,847 | 1,553 | 294 | 20 | 425 | - 578 |

(a) Excludes small production in W.A.

(b) Excludes imported hop extract.

(c) Not separately recorded but only small quantities involved.

Source: A.B.S., annual industry statistics 1960-1973.

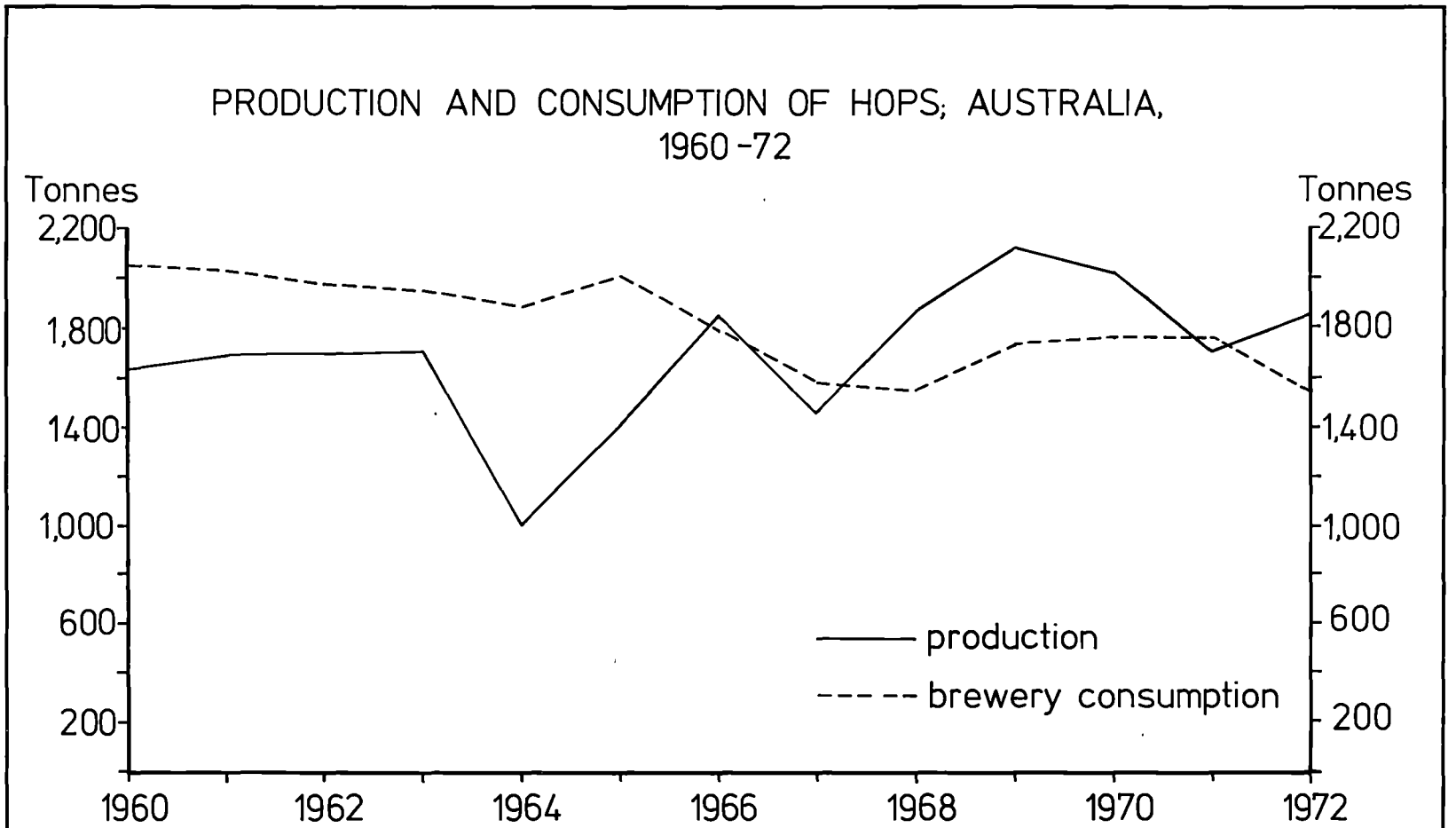



Figure III.2

SOURCE C B C S ANNUAL INDUSTRY STATISTICS 1961-73

would have shown that by this time Australia had become dependent upon disposing of considerable surplus production on an uncertain overseas market and that future years of domestic shortfall were unlikely. Certainly, a leading hop factor had taken steps in southern Tasmania to curtail production by closing one of its community kilns and declining to sign new contracts with many of the smaller growers, but the relative decline in planted area was much smaller than the decrease in grower numbers during the period (see Table III.4). The decline in grower numbers from 1968 to 1972 was a decline of 33.3% with 37 growers ceasing production in Tasmania, but the bearing area declined by only 69 hectares or 11.4%. One reason for the relatively small decline in bearing area was that the growers who left the industry were mainly very small producers, but during the same period the bearing area in the Scottsdale region increased from about 20 hectares to about 84 hectares (A.B.S., 1968b; 1972).

TABLE III.4

NUMBER OF GROWERS AND BEARING AREA IN TASMANIA 1960-1972

| Year | No. of Growers | Bearing Hectares | Year | No. of Growers | Bearing Hectares |
|---|---|---|---|---|---|
| 1960 | 99 | 581 | 1967 | 106 | 594 |
| 1961 | 103 | 569 | 1968 | 111 | 608 |
| 1962 | 104 | 571 | 1969 | 108 | 607 |
| 1963 | 106 | 588 | 1970 | 100 | 569 |
| 1964 | 108 | 592 | 1971 | 81 | 530 |
| 1965 | 109 | 597 | 1972 | 74 | 539 |
| 1966 | 107 | 604 | | | |

Source: C.B.C.S., 1965; 1973.

A further reason for the decline in grower numbers during the latter part of the period in question relates to the internal cost structure of many of the smaller farms. As has been indicated in earlier sections, many smaller growers were able to operate without hired labour for most of the year. Those who could use family members at picking time were fortunate in being able to avoid picking costs, but others found that after about 1968, price increases for hops were not keeping pace with increased costs of hand picking. The reason for this relates to reduced unit-costs of production obtainable on large holdings with the advent of mechanical harvesters and other technological improvements such as reduced rates of cultivation and increased use of herbicides to combat weeds. Price increases were not sufficiently great to cover cost escalations for the small producer who was unable to derive much benefit from improved technology, (Makeham, 1970).

In 1970 the Makeham study found a cost differential of 4¢ per lb. for harvesting in favour of mechanical harvesting on medium-sized hop units (4 - 12 hectares). This represents 5.5% of the price paid for the commodity, then about 76¢ per lb. Growers in the small category (less than 4 hectares) were found to have capital invested of $10,600 to $11,100 per hectare; return to capital varying from a low of -3.4% to 3.8%. It is readily apparent that a difference in costs of say, 2,000lb.X 4¢ per acre would amount to some $200 per hectare or about 2% of invested capital. That this differential worsened in subsequent rears was confirmed from the field survey where many former small producers cited it as the reason that they had not been able to accumulate funds in order to survive the over-supply situation of 1973-74. As further indication

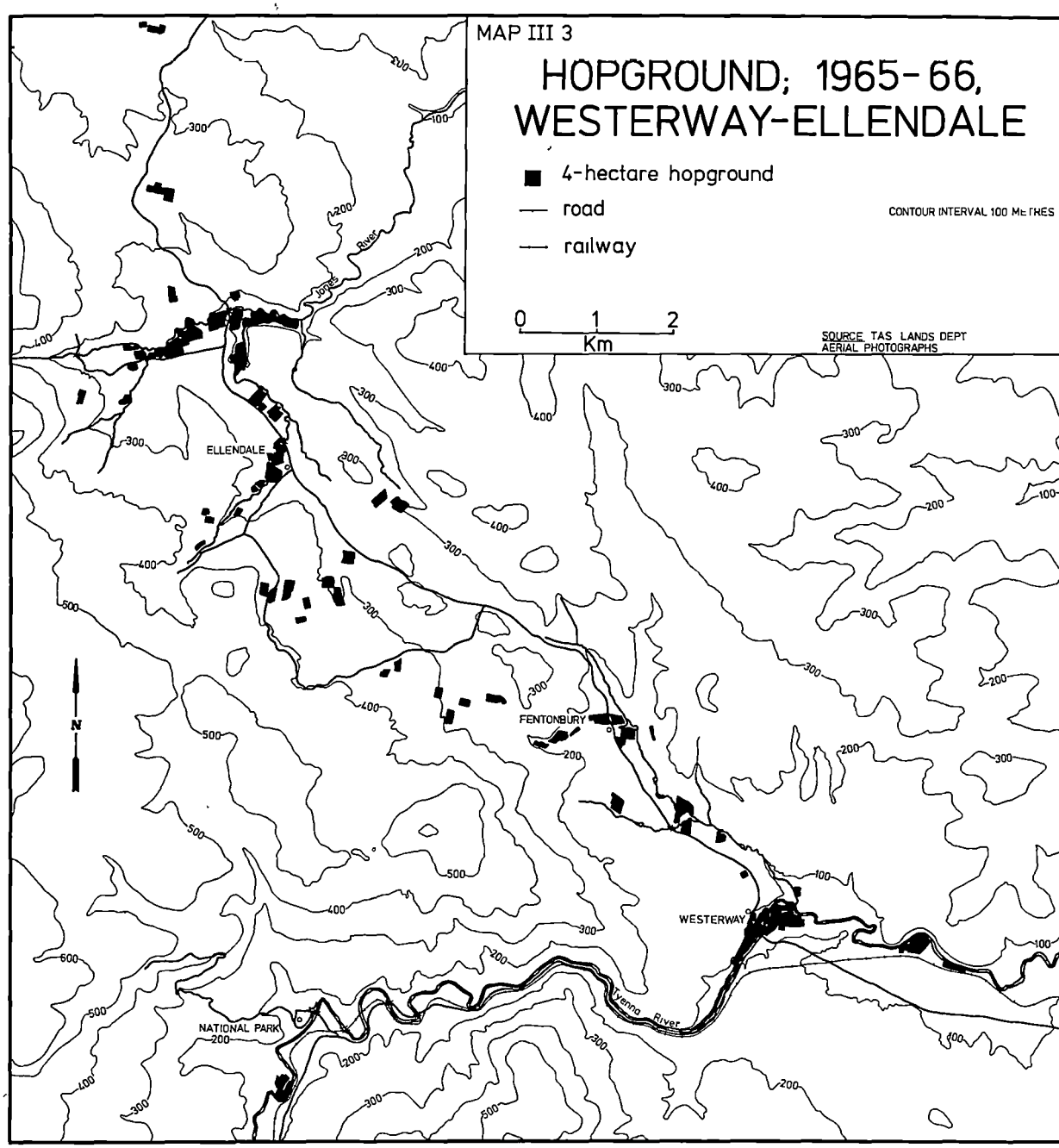
of this price squeeze, one small grower pointed to the fact that from 1955 to 1965 he was able to send three children to private schools and to take an annual interstate holiday on the earnings from five acres of hops. After 1965 his earnings fell progressively until in 1972 he abandoned hop growing as a profitable activity. It should be borne in mind that had growers been paid for the increased brewing value of their hops and had smaller growers' costs been taken into account more adequately when price agreements were being reached there may well have been a more gradual adjustment of the small growers to the changed economies of scale for production in the 1970's; small growers would have been able to choose to leave the industry with capital reserves sufficient to commence alternative enterprises.

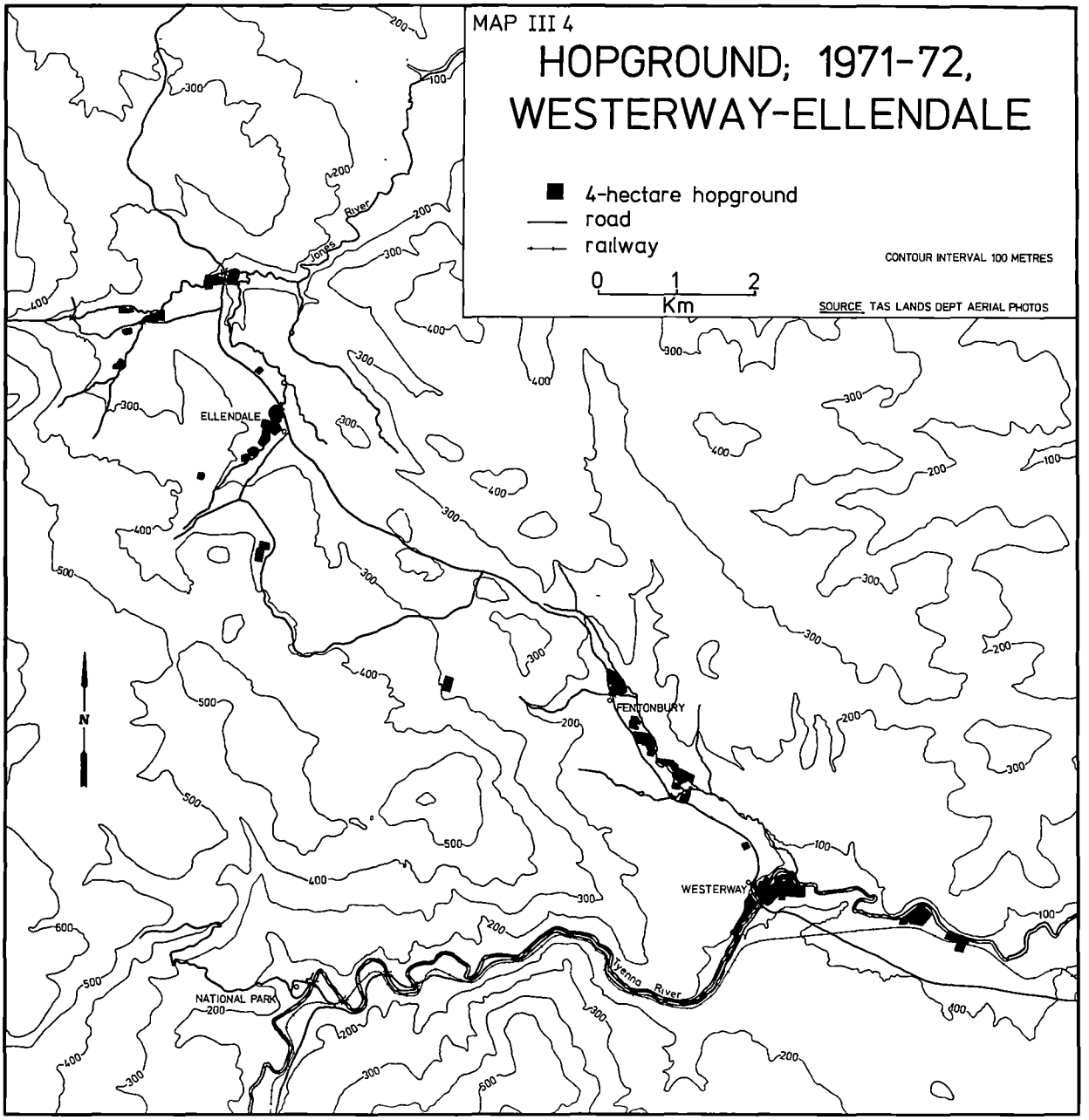
As is apparent from Table III.3, 1968 was the first year in which domestic production was seriously above the level of demand in Australia; this situation seems to have been apparent to the leading hop factor which began to acquire medium and large properties not already in its possession in the core locality, and which began a systematic program of consolidation of hopgrounds in the region. This was at the very time that small growers were being told to replant their hopgrounds with new hop varieties. Some small and medium-sized growers saw the added costs of a change to a new hop variety as a gamble they were not prepared to take, and several left the industry with accrued profits from years of successful production. By contrast, the leading factor survived the period of over-supply in 1973-74 and by 1977 was the owner of all but one of the remaining hop enterprises in the core region.

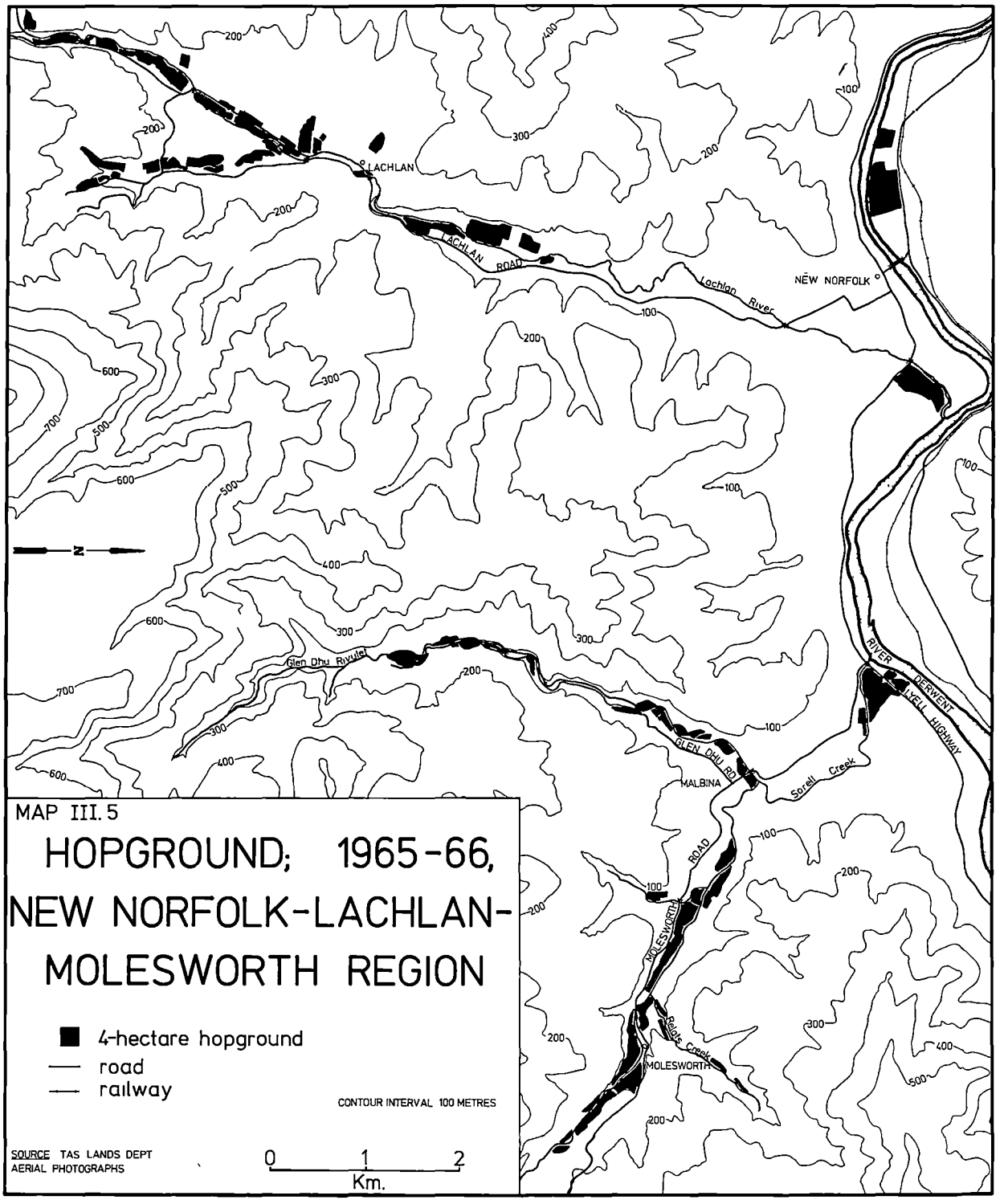
Aerial photography of the Westerway-Ellendale localities

has been used to compile maps of the region for the 1966 and 1972 crop years (Maps III.3 and III.4), and the hopgrounds have been verified as to ownership and enterprise structure during the field survey. This region underwent major reductions in both holdings and planted area during the period, unlike the New Norfolk-Lachlan-Molesworth region which saw similar change much more recently and for which the photographic coverage in the period is only available for the 1966 crop year (Map II.5). The two regions, which have been considered in the discussion of earlier periods to have been subject to considerable influence from fluctuations in the extensive margins of production, contrast markedly in their response to the prevailing economic changes between 1966 and 1972.

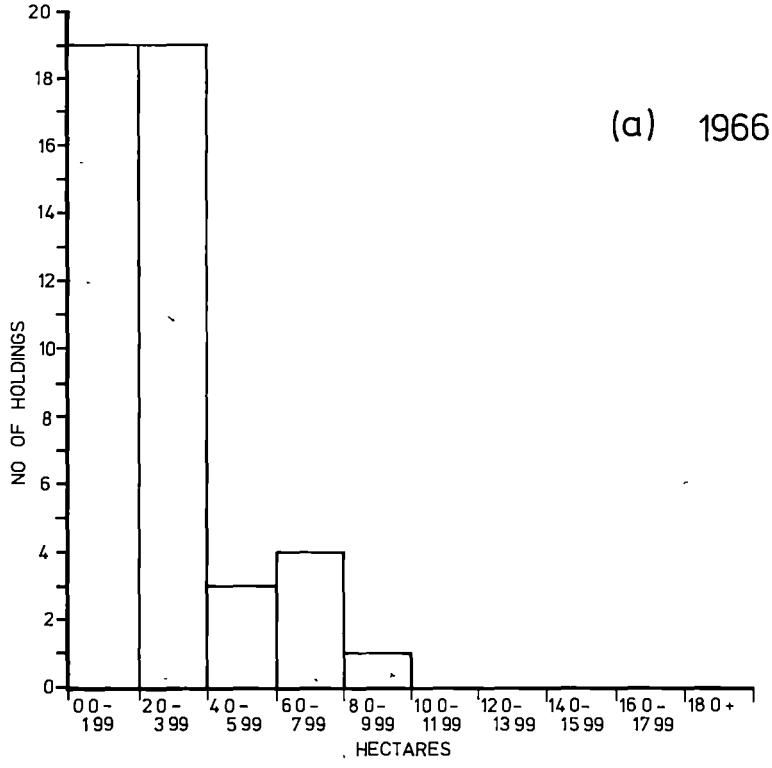
Although Lands Department records coincide with the 1966 aerial photography (Maps III.3 and III.5), they were not coincident with later photographic coverage. The verification of precise dates when production on various hopgrounds either ceased or commenced has been possible in many cases from the field study and interviews with growers or former growers, but in quite a number of cases information is vague and where former growers have departed from the locality neighbours are only able to state that production ceased in ... 'about 1969 or 1970' etc. Nevertheless, it is apparent that within this period the Westerway-Ellendale region underwent a substantial decline both in absolute terms and relative to the New Norfolk-Lachlan-Molesworth region. The decline in grower numbers, and changed size-distribution for holdings in the Westerway-Ellendale region is shown in Figure III.3. During the period from 1966 to 1971, grower numbers declined from 46 to 23, and while mean hopground size declined only from 2.53 hectares to 1.83 hectares there was a substantial decline in the median size of hopground from 2.12 to 1.01 hectares. This reflects the sub-


MAP III 3
HOPGROUND; 1965-66,
WESTERWAY-ELLENDALE
4-hectare hopground
road
railway
CONTOUR INTERVAL 100 METRES
0 1 2
Km
SOURCE TAS LANDS DEPT
AERIAL PHOTOGRAPHS
ELLENDALE
FENTONBURY
WESTERWAY
NATIONAL PARK
Jones River
Tyenna River
N


MAP III 4
HOPGROUND; 1971-72,
WESTERWAY-ELLENDALE
4-hectare hopground
road
railway
CONTOUR INTERVAL 100 METRES
0 1 2
Km
SOURCE TAS LANDS DEPT AERIAL PHOTOS
ELLENDALE
FENTONBURY
WESTERWAY
NATIONAL PARK
Jones River
Tyenna River
N


LACHLAN
LACHLAN ROAD
Lachlan River
NEW NORFOLK
Glen Dhu Rivulet
GLEN DHU RD
MALBINA
Sorell Creek
RIVER DERWENT
LYELL HIGHWAY
MOLESWORTH ROAD
MOLESWORTH
Reads Creek
MAP III. 5
HOPGROUND; 1965-66, NEW NORFOLK-LACHLAN-MOLESWORTH REGION
4-hectare hopground
road
railway
CONTOUR INTERVAL 100 METRES
SOURCE TAS LANDS DEPT AERIAL PHOTOGRAPHS
0 1 2
Km.

Size-distribution of hop holdings;
Westerway-Ellendale region,



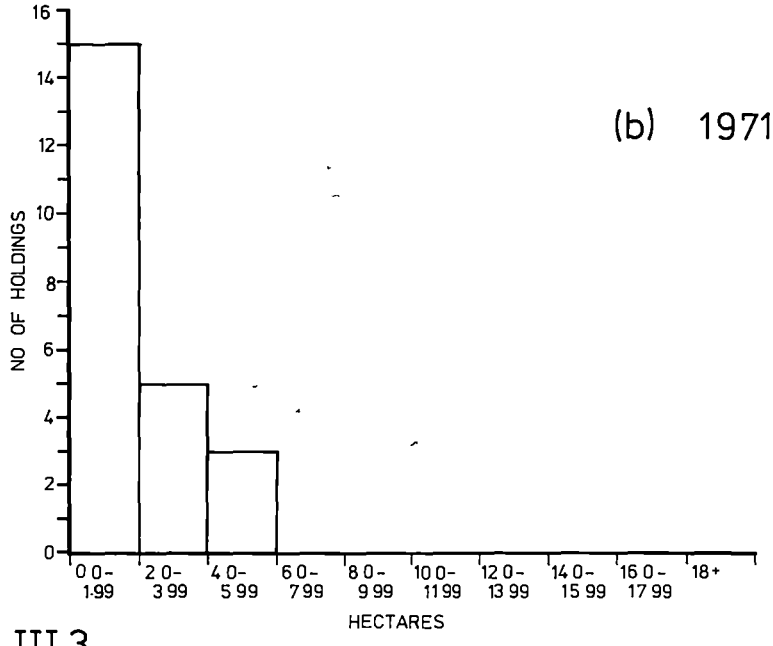




Figure III.3

SOURCE LANDS DEPT RECORDS

stantial fall in the size class of 2.0 to 3.99 hectares from 19 units in 1966 to only 5 in 1971. Interviews with seven former growers in the locality confirm that this size class was the one most seriously affected by the high costs of labour and other external cost increases, being not large enough to warrant purchase of a mechanical harvester but too large for picking to be carried out by family labour. Of the three former growers in this size class interviewed, two indicated to the writer that their level of debt to the factor was too great to be able to handle from production on a reduced acreage; it was noted also that advancing age may well have been a contributing factor to the decision not to continue in hop production. In several cases among the seven former growers interviewed mortgages were called by the hop factor and farms were actually relinquished by their owners.

The decline in the hopground size class of less than 2.0 hectares was much less marked, being from 19 to 15 such units. The remainder of the loss occurred in the larger class sizes. The changed pattern of production is clearly evident when Maps III.3 and III.4 are compared. Total planted area declined in the period from 116.4 hectares to 42.1 hectares, a loss of 63.8%.

In contrast to the Westerway-Ellendale region, total planted area in the New Norfolk-Lachlan-Molesworth region decreased only fractionally between 1966 and 1971 from 123.9 hectares to 121.1 hectares or by only 2.3%. Grower numbers in this region declined by four from 29 to 25, and from Figure III.4 it is again evident that the greater part of the loss was in the 2.0 to 3.99 hectare size class, although the number here is probably not statistically significant with a decline in this category of three of the four 'lost' growers. The field survey confirmed

Size-distribution of hop holdings, New Norfolk-Lachlan-Molesworth region

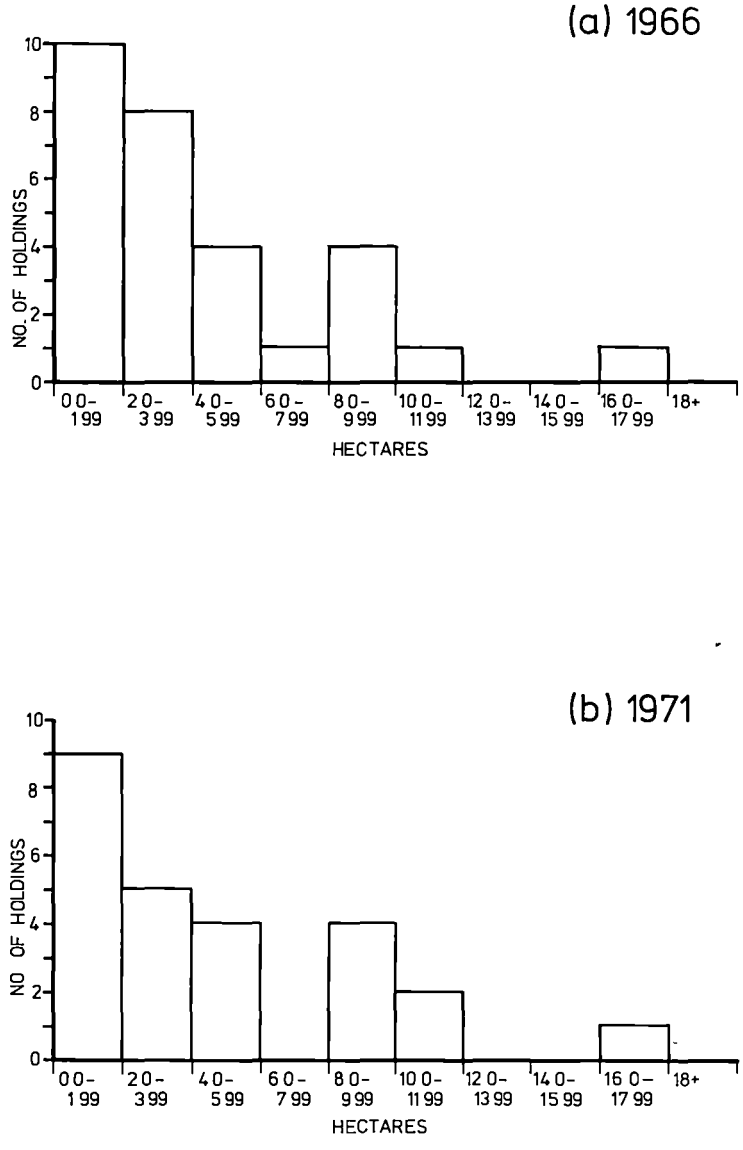



Figure III.4

SOURCE: LANDS DEPT RECORDS

the farm valuation records which indicated that hop growers left the industry rather than trying to adjust their enterprise structure to lower inputs of paid labour and increased relative inputs of family labour; there seems in this region to have been even a short-lived tendency for some growers to over-extend their credit and purchase a small harvesting machine at a cost of some $16,000 in 1970 when their area under hops was only 4 hectares or so (Nicholson,1977). The results were predictable, and in 1977 two of these machines were for sale at $3,000. Again, as in the earlier time period, this region continued to maintain a more balanced distribution of holding sizes with a mean of 4.3 hectares in 1966 and 4.8 hectares in 1971. In contrast again to the Westerway-Ellendale area median size of holdings increased from three to four hectares in this region during the period.

It will be shown in the analysis of yield variations at the micro-regional level in Chapter IV that the New Norfolk-Lachlan-Molesworth region, particularly the narrow valleys south and south-east of New Norfolk, produced excellent hop yields and that growers in this region therefore had every reason to believe that they should change over to the Pride of Ringwood variety, and that in many cases future returns were then perceived to be sufficient to warrant the purchase of harvesting machines. Some of the structural adjustment had commenced in the region even before 1966 with one large grower purchasing a harvester in 1965; the remainder of the change had occurred by 1972. Increased capital inputs, even when partly a substitution for annual labour costs for hand picking, demand further adjustments to farm structure, and in some cases the need was for increased inputs of land to gain maximum economies of scale. In most cases, this would have

## Size-distribution of hop holdings, core region

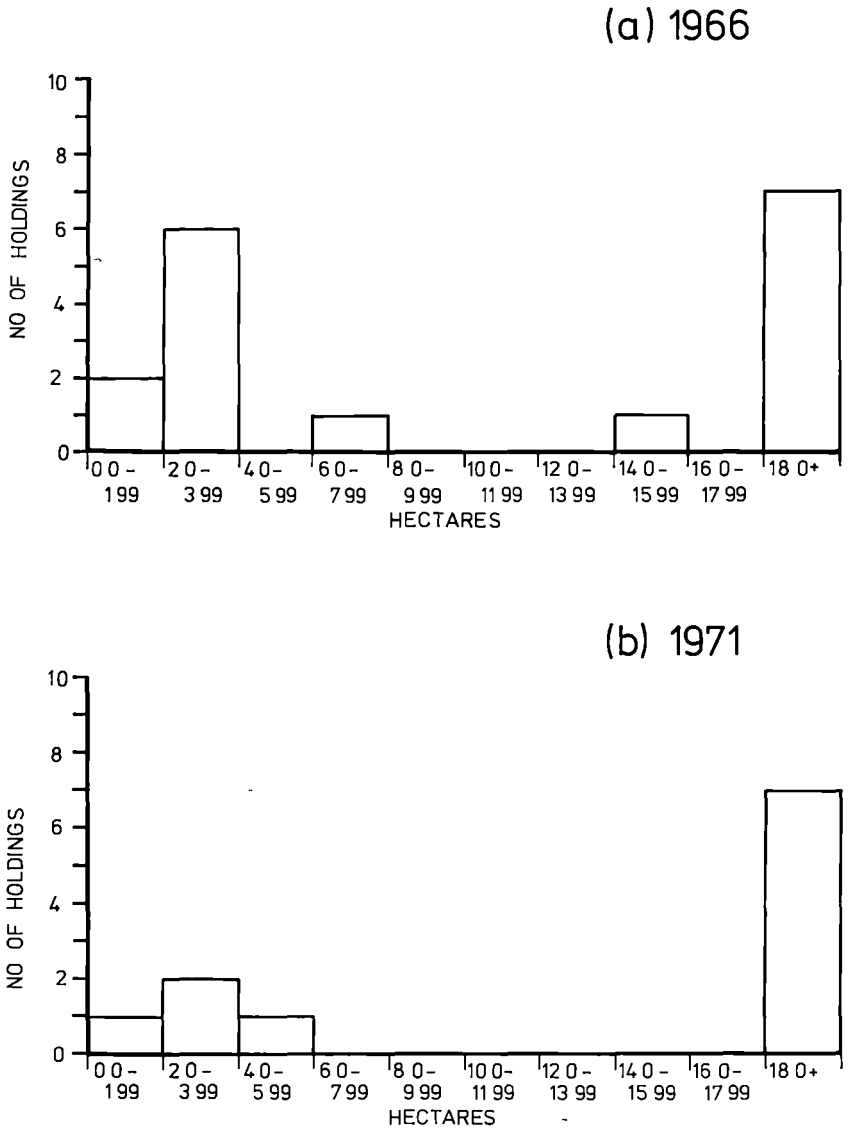
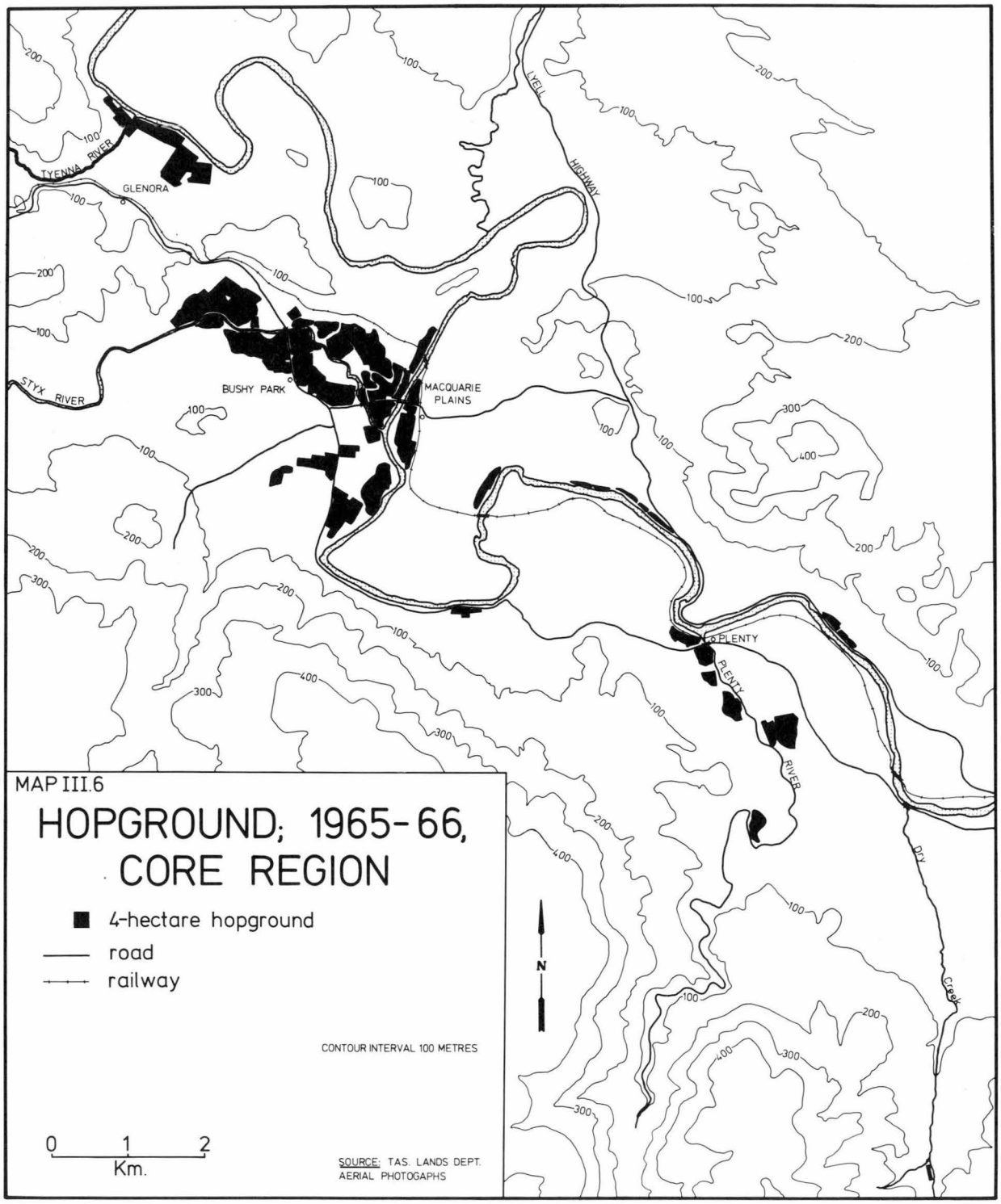



Figure III.5

SOURCE LANDS DEPT RECORDS


TYENNA RIVER
GLENORA
STYX RIVER
BUSHY PARK
MACQUARIE PLAINS
LYELL HIGHWAY
PLENTY
PLENTY RIVER
Dry Creek
N
MAP III.6
HOPGROUND; 1965-66, CORE REGION
4-hectare hopground
road
railway
CONTOUR INTERVAL 100 METRES
0 1 2
Km.
SOURCE: TAS. LANDS DEPT. AERIAL PHOTOGAPHS

involved additional purchase costs as suitable hop land in the narrow valleys was normally under hops; obtaining more hop land would therefore have involved purchase of existing hopground from neighbours who were leaving the industry. This course of action was followed by two medium-sized growers in the period, and in 1977 although still 'medium'-sized they are able to operate profitably (Bradshaw, 1977). In total, at least six of the 25 growers remaining in 1971 had actually purchased harvesting machines (Grower survey, 1977) and of these it is known that subsequent to this investment five growers expanded their hopground or purchased hopground from other growers who were leaving the industry.

The core region from Plenty to Glenora also underwent considerable change in the period between 1966 and 1972, grower numbers declining from 17 to 11 and planted area falling from 284.4 hectares to 208.8 hectares, a decline of 26.6%. During the period, one large holding ceased production (Fig. III.5), representing the policy of consolidation by the largest hop factor, and four holdings in the 2.0 to 3.99 size category ceased production, again reflecting the pattern noted in the other regions. Mean holding size in the region increased from 16.7 hectares to 18.99 hectares but there was a substantial increase in the median size of holding from 6.1 to 19.7 hectares during the period from 1966 to 1972. Map III.6 indicates planted area for the 1965-66 season.

In the 1970 Makeham Report, commissioned by the Australian Associated Brewers, the point was made that the over-supply problems that had arisen in the industry were due to a poor information flow and that when decisions regarding the replanting

with Pride of Ringwood and purchase of harvesting machines were being made, these decisions were "based on a traditional assessment of the market in pounds of raw hops required to brew an ever expanding volume of beer" (Makeham, 1970, 3). The report blamed the brewers' passion for secrecy and the hop factors, stating that:

> "in so far as the current problems are due to inadequate information flow in the industry, we consider that the factors have failed in their principal service role to the industry"
> (Makeham, 1970, 3).

The fact that the leading hop factor in Tasmania was also the largest grower throughout the period under review leaves no doubt that the production problems and cost structure of the industry were well understood by the factor, but for one reason or another regulation of the industry by legislative action was avoided; governments, factors and growers preferring to allow the free flow of market forces to take its toll of the smaller producers. Unfortunately for the smaller producer, the granting of contracts to growers was in the hands of factors, and naturally they wished to retain a large portion of the productive enterprise. Many small producers were simply unable to obtain contracts and went out of business.

In its analysis of Tasmanian hop producers' ability to diversify farm income away from hops, the Makeham Report (1970) concluded that of 104 properties only five fell into the category of being owned by 'companies who have other commercial interests', but that these properties were also the largest hop units in the state. The conclusion was that 'the producers who have the

largest hop gardens are those who generally are least dependent on hop production for their personal income' (Makeham, 1970, 15). On the other hand, 44 properties fell into the category of farms which offered no opportunities to earn a living other than from hop production.

Hops constituted at least 75% of the income on all 20 farms from which questionnaires were returned, and 16 growers indicated that income from hops was 'financially rewarding' in most years between 1950 and 1969 with the exception of 1964 which was widely reported to have been an unsatisfactory year due to wind damage, and some flood damage in 1952 was reported by three growers. The only other periods of unsatisfactory income were those where growers were replanting with the new hop varieties; 12 growers indicated that they replanted to Ringwood Specials at various stages in the 1960's, suffering losses of production as a result. Three growers had been growing hops for relatively short periods only, but all three, and a total of 15 of the 20 who returned such details indicated that they had also lost production in the early 1970's due to replanting with the Pride of Ringwood. In no case where growers were still in production in 1972 was there not a period of at least two years where income was unsatisfactory due to replanting, and 11 growers reported twice going through periods of replanting. Only one grower indicated that he had not had any period where income was not satisfactory. By 1973-74, 12 of the growers who reported replanting to Pride of Ringwood hops between 1969 and 1972 were in the position of having no market for their crop and therefore had to cease production altogether. Subsequently, another 6 of the 20 have left the industry. A similar pattern was found to have occurred as far as the

purchase of harvesting machines was concerned; a number of decisions to do so on the part of medium-sized and even several small growers being made in the late 1960's or early 1970's when it was already clear within the industry that over-production would be inevitable in the near future.

The conclusion is inescapable that had hop factors played a more informative role in alerting growers to the likely consequences of over-production, many expansion and modernization decisions may not have been taken. Although a number of growers left the industry rather than modernize their production units, others did not, and many of the latter were to invest heavily in expensive machinery, sheds and related items, and to forego income while replanting to Pride of Ringwoods only to find that within two or three years their investment was worthless. The information flow within the industry in fact seems to have been so poor that expansion of production was occurring at the extensive margins of production around Ouse and on the Tasman Peninsula at the very time that total production should have been reduced.

The extent to which the emergence of a new hop producing region in the north-east of the state with its improved technology and advantages of scale economies influenced the pace of structural adjustment and modernization in the south of the state is difficult to quantify. Undoubtedly there was some impact as evidenced by the fact that one of the largest private growers in the south actually joined the Scottsdale Hop Producers' Association (Warner, 1977). The leading hop factor in the south also followed the north-east in establishing its own pelletizing plant. The major impact seems to have been indirect in that had the domestic

Australian market remained undersupplied from Australian hop production the pace of structural change within the industry would have been more gradual. From the author's survey of former producers in the south of the state opinion seems fairly evenly divided as to whether it was mainly the new hop variety or the new production in the Scottsdale region that led to the demise of the industry in the south, but there was general agreement that both factors contributed to the oversupply of the domestic market.

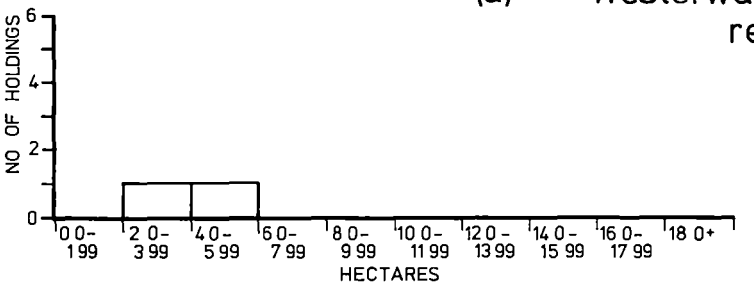
Contraction of the extensive margins of production 1973-1978

The last five years in the hop industry in Tasmania have seen the most calamitous over-production and consequent collapse of grower numbers in the entire history of the industry. The decline in planted area in the south of the state has been dramatic; the north-east has fared much better.

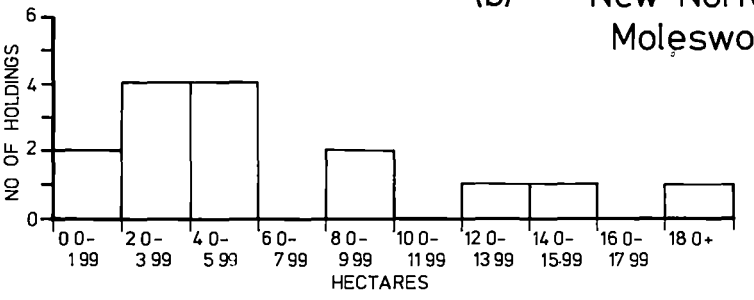
As has been seen in the previous section, the conditions for collapse had been building since at least 1968 and some reductions in all areas in the south had occurred prior to 1973, particularly in the Westerway - Ellendale region. However, since 1972 this region has lost all but two growers, and there are special reasons why these two have survived. The New Norfolk - Lachlan - Molesworth region fared better at least until 1975 (Figure III.6) but by 1978 retained only 6 growers including the two largest growers, two intermediate-sized growers and two small ones (Figure III.7). In contrast, as seen in Figures III.6 and III.8 the Bushy Park - Glenora core area lost only its very small growers; retaining the five major properties of the leading hop factor (now actually worked as six separate properties), one larger private grower and a holding which forms part of one of the two

Size-distribution of hop holdings, 1975;

(a) Westerway-Ellendale region




(b) New Norfolk-Lachlan-Molesworth region




(c) Core region

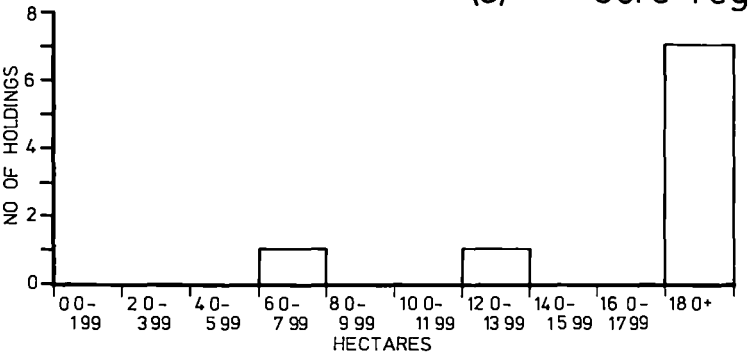
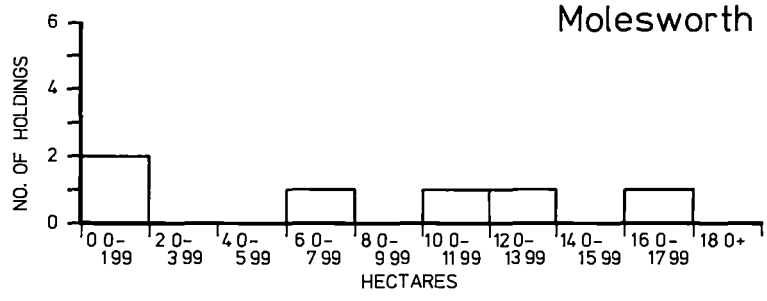



Figure III.6

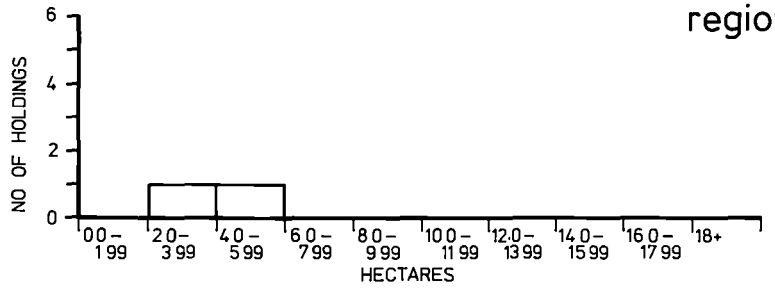
SOURCE LANDS DEPT RECORDS

Size-distribution of hop holdings, 1978;

(a) New Norfolk-Lachlan-Molesworth region




(b) Westerway-Ellendale region




SOURCE AUTHOR'S FIELD SURVEY, DEC '77

Figure III.7

Size-distribution of hop holdings in Core region; 1978

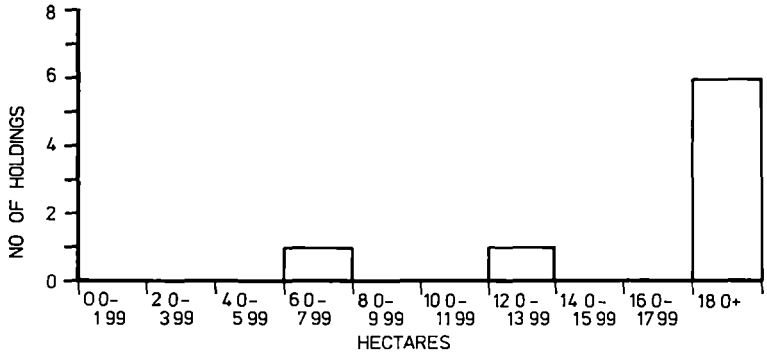



Figure III.8

SOURCE AUTHOR'S FIELD SURVEY, DEC 1977

surviving farm units in the Westerway - Ellendale region. All hop production in other localities in the south of the state, with the exception of the substantial holding at Ranelagh on the Huon River, has ceased.

The situation that has arisen within the last five years appears to have repeated the collapses of the period following 1884 and that following 1929. Even the timing between these two dates and the present collapse which followed the 1974 crop year is an equal span of 45 years. However, there are at least two main differences with the present collapse as the Makeham Report foreshadowed. One relates to the fact that the over-production has been at least to a large extent caused by the insistence of the brewing industry on the one variety of hop without compensatory price increases to cater for the higher alpha acid yield. The second difference is that at least with the present collapse there appears to be a viable export market in Europe for Australian hops. However, a note of caution should be sounded here, for although the price of hops in Europe is currently above the domestic price in Australia (Davey, 1977) due to the agricultural price support schemes operating within the E.E.C., growers in Germany are currently switching to higher alpha acid hops and with the vast size of hop grounds in that country the effect on Australia's medium to long-term export chances is likely to be devastating.

The sudden, dramatic oversupply which was the culmination of about five years in which domestic production was well ahead of domestic consumption occurred as a result of two events in 1973-74. One was the extra high yield of hops in that year,

details of which are by no means fully portrayed in the A.B.S. (1974) annual industry publication. The state yield is given as 2772kg. per hectare and the yield in the north-east is indicated as 2835kg. per hectare. Here however, the yield is again calculated by dividing the total production of 612 tonnes for the three north-eastern municipalities by their planted area of 216 hectares, not all of which was bearing area. In fact, the three municipalities had only 70.8 hectares of planted area in 1972-73 (C.B.C.S., 1973) and it is therefore not possible that the whole 216 hectares could have been bearing area by 1973-74. The 1974 A.B.S. publication indicates that the three municipalities in question had 501,000 hills of hops in 1973-74 but fails to state whether all of these were actually strung. Assuming that they were, the effective bearing area in the north-east for that year is found by dividing the number of hills by a factor of 2965 on the basis that a 'hop acre' consists of 1200 hills and therefore a 'hop hectare' is 2.471 times this number of hop hills. The effective bearing area for the north-east in 1973-74 was therefore 168.9 hectares. The same technique applied to the New Norfolk municipality reveals that it had 362.9 hectares of bearing hops as compared with a published 380 hectares of planted area for that year. On this basis then, the yield for the north-east was 3622kg. per hectare. This is almost 29 cwt. per acre under the earlier measurement system. When it is considered that most of these hops were of the seedless variety with a consequent weight reduction of up to 20% (Davey, 1977) the yield is comparable to 35 cwt. per acre under the earlier system. Such yields, although reported by the Australian Bureau of Census and Statistics in the late 1930's and early 1940's are not

substantiated, except in isolated cases, by grower receipts, and have been shown in Chapter II.2 to have been erroneously derived by the C.B.C.S. which incorporated green weight statistics with dry weight statistics to derive state average yields during the period. At the same time, yields of this magnitude in recent years have been confirmed by the writer after discussion with growers in the north-east of the state.

The second event which occurred at the same time as the 1973-74 bumper crop was that the export market slumped to a four-year low of only 117 tonnes (A.B.S., 1975). It can be seen from Table III.5 that what had been effectively a situation of under-supply due to a cumulative shortfall of production below domestic consumption and export sales changed dramatically in one year to a surplus of over 50% of annual domestic requirements. The situation worsened in subsequent years, despite a recovery of the export market, largely because of the virtual 100% Pride of Ringwood planting which by this time existed in Tasmania and Victoria, and the consequent continuation of the decline in domestic brewery demand. In addition, it is now widely recognized throughout the industry that the Pride of Ringwood is much more tolerant of a variety of environmental conditions than were the earlier English hop varieties and hence the periodic fluctuations in yield are not as severe as they were in earlier years. In 1963-64 for example, wind damage to hop bines at the climbing stage was widespread throughout the state and in Victoria, cutting the yield to a low 1149kg. per hectare. Since 1967 there has not been a year in which yield for Tasmania has fallen below 2000kg. per hectare. The 1977 crop year saw the disposal of surplus production on the export

TABLE III. 5

CHANGING IMPORT, EXPORT, SUPPLY AND DEMAND FOR HOPS IN AUSTRALIA 1973 - 1977

| Year | Australian Production (a) Tonnes | Australian Consumption by Breweries (b) Tonnes | Surplus or Deficit Domestic Production Tonnes | Imports (b) Cones and Lupulin Tonnes | Exports Tonnes | Cumulative Surplus on 1972 Base of -578 (c) Tonnes |
|---|---|---|---|---|---|---|
| 1972-73 | 2,113 | 1,294 | 819 | 37 | 878 | - 600 |
| 1973-74 | 2,864 | 1,391 | 1,473 | 16 | 117 | 772 |
| 1974-75 | 2,270 | 1,160 | 1,110 | 20 | 746 | 1,156 |
| 1975-76 | 1,875 | 954 | 921 | 11 | 533 | 1,555 |
| 1976-77 | | | | | | |

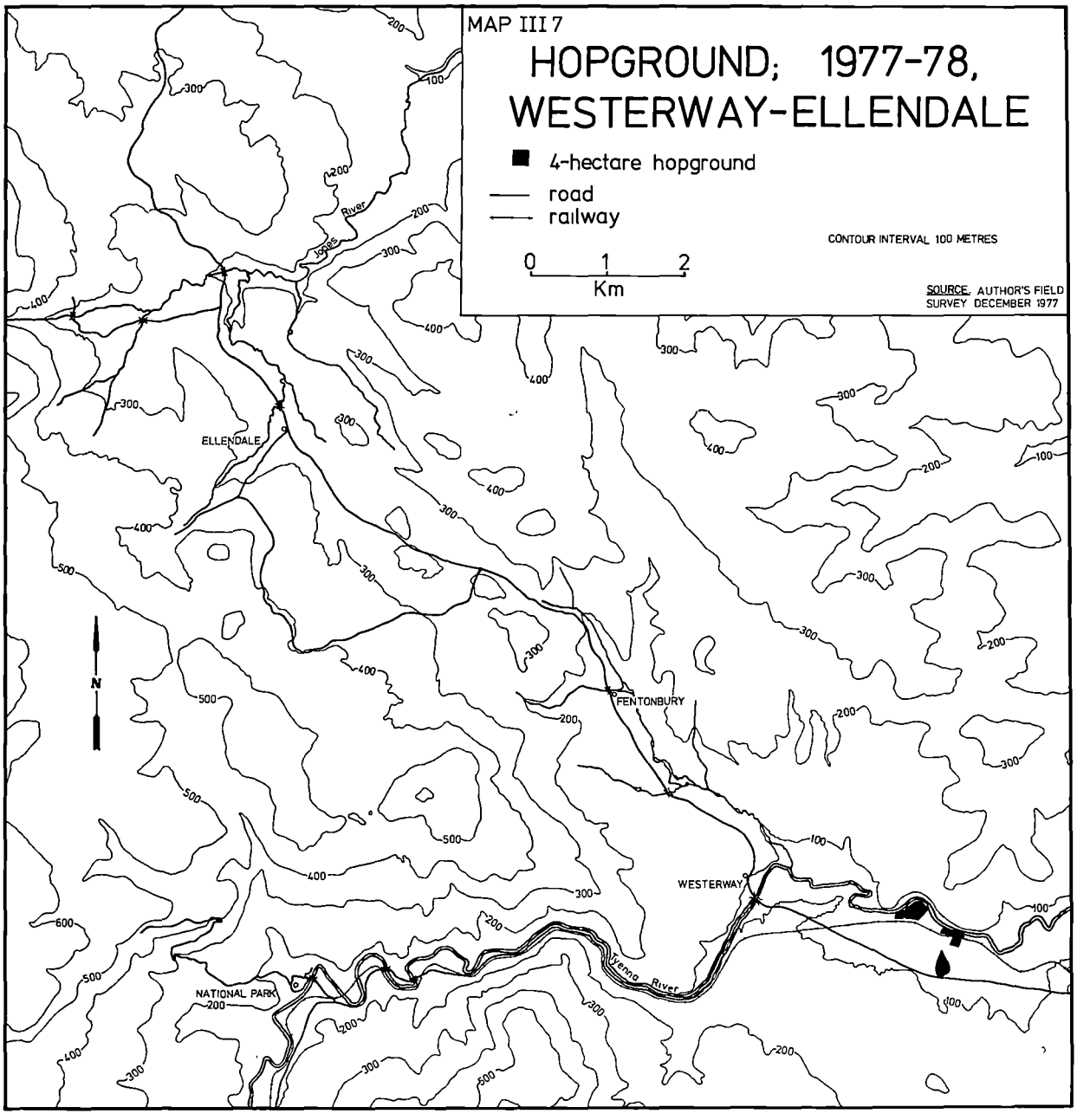
(a) Excludes small production in W.A.
(b) Excludes imported hop extract.
(c) See table 111. 3.

Source: A.B.S. 1973 - 1978 annual publications on the hop industry

market so that the apparent cumulative surplus did not become worse, and present indications are that export orders for 1978 crop year may well exceed supply for the first time since prior to 1973-74 (Davey, 1978). At the time of writing, export figures for 1977 and 1978 are not available. It would appear, however, that the collapse of 1973-74 - as with earlier such collapses - will be followed by gradual recovery within the industry. Indications to this effect are that the domestic demand for hops in 1977-78 has risen by 3% to 4% (Davey, 1978), and in 1976-77 Australian consumption was 76% of total hop production (Graham, 1978); growers who have remained in business throughout the last few years may therefore have some reason for optimism in the current period.

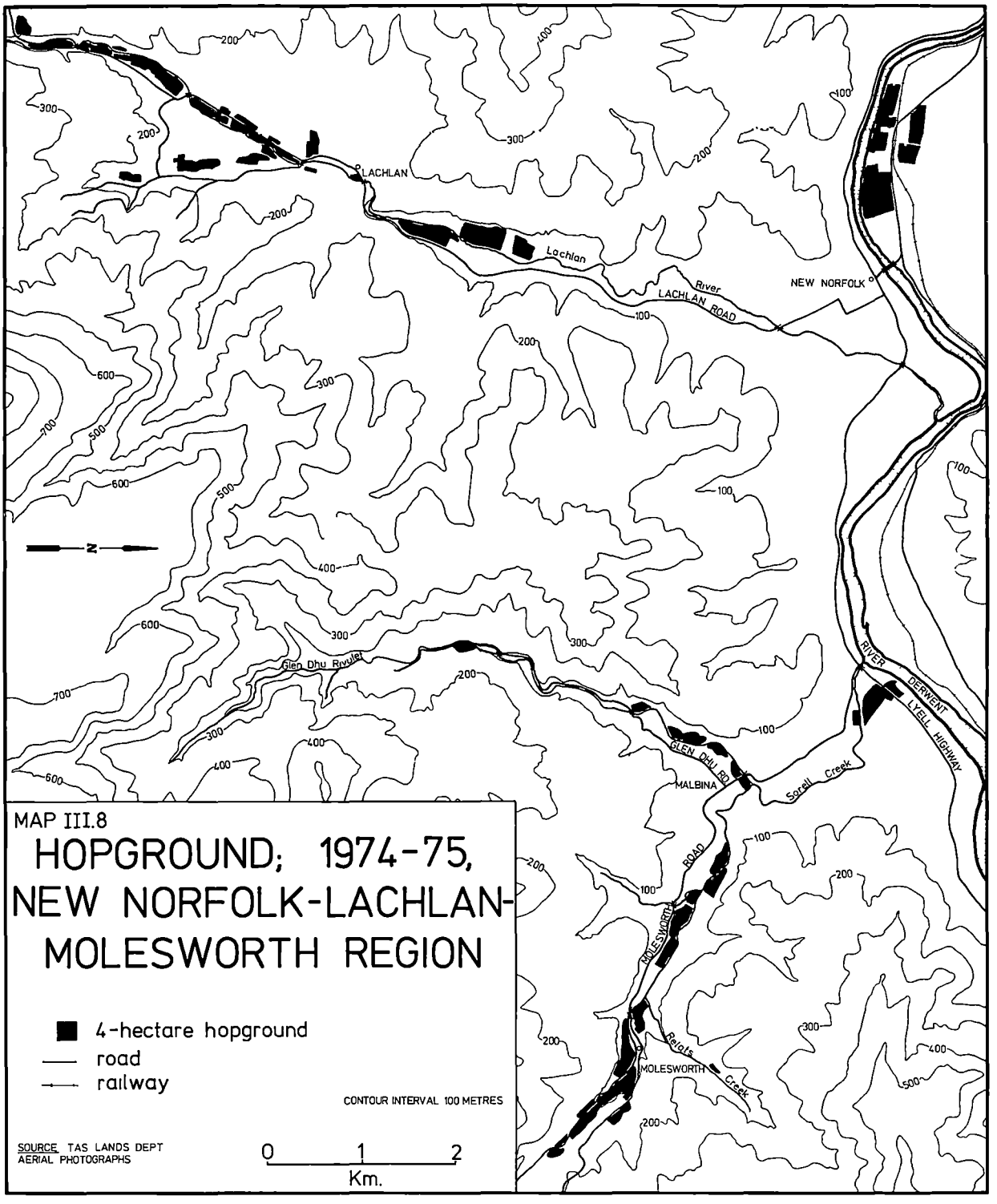
The Westerway-Ellendale region in 1978 retains only two hop growers, one of whom is a dairy farmer as well. This grower stated to the writer in 1977 that until the 1973-74 crop year his hop production had enabled him to maintain an otherwise marginally profitable dairy farm but that since that time the dairy farm had enabled him to retain his hopgrounds. The other grower in the region works his farm principally as a hop production unit but it is worked in partnership with a second hop farm in the Glenora area. The combined operation is regarded as one farm unit but small income from livestock and off-farm income at present supplement income from hops and help to maintain the farm unit. The decline from the 1971 total of 23 growers in this region is most marked when Maps III.4 and III.7 are compared.

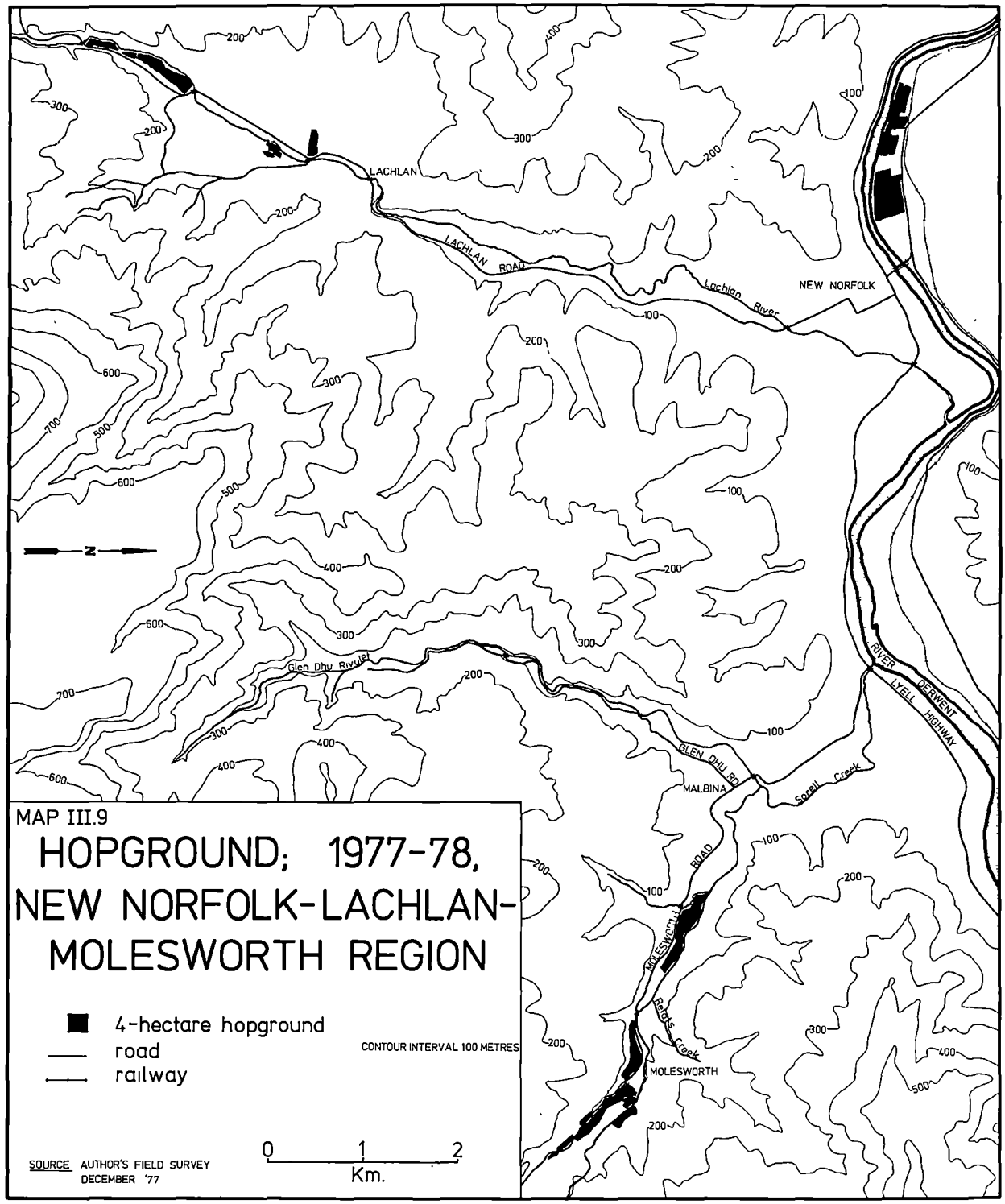
The less marked, though still substantial decline in the


MAP III 7
HOPGROUND; 1977-78,
WESTERWAY-ELLENDALE
4-hectare hopground
road
railway
CONTOUR INTERVAL 100 METRES
0 1 2
Km
SOURCE. AUTHOR'S FIELD SURVEY DECEMBER 1977
ELLENDALE
FENTONBURY
WESTERWAY
NATIONAL PARK
Jones River
Yarra River
N

New Norfolk-Lachlan-Molesworth region in the last five years appears to be partly due to larger mean hopground size which in 1971 was 4.8 hectares, and partly a result of the higher average yields in the region which enabled farmers to withstand relative price declines for a longer period. By 1974-75 the number of farms had declined to 15 with a mean planted area of 5.2 hectares (see Map III.8). Of the 10 farms that had ceased production since 1971 (see Fig. III.7), two had hop areas which were in the intermediate size class and the remainder had hop areas in the two smallest classes. It is worth noting that at the same time the largest grower in the region expanded his planted area in anticipation of good export demand (Warner, 1977), only to find that this did not eventuate. This expansion is seen in the holding at New Norfolk when Maps III.5 and III.8 are compared. Subsequent reduction of the expanded area is seen in Map III.9. By 1978 only six growers remained in this region, mean size of holding increasing to 7.3 hectares of hopground while total planted area in the region declined to 47.4 hectares. Four of the six growers have mechanical harvesters and dry their own hops, and of the remaining two growers one will subcontract the harvesting and the other will hand-pick. The latter unit is still planted to Ringwood Specials and markets its hops principally for home brewery consumption.

The core region in the Derwent Valley has remained virtually stable in grower numbers and planted area since 1975, having lost the three smallest growers after 1973-74 (see Fig. III.8). Only slight changes in planted area have occurred within recent years, mainly involving straightening of field boundaries and elimination of poorer sections on the company-owned estates at Bushy Park. Mean hopground size per farm unit was 28.8


LACHLAN
Lachlan River
LACHLAN ROAD
NEW NORFOLK
Glen Dhu Rivulet
GLEN DHU RD
MALBINA
Sorell Creek
RIVER DERWENT
LYELL HIGHWAY
MOLESWORTH ROAD
MOLESWORTH
Reigate Creek
MAP III.8
HOPGROUND; 1974-75, NEW NORFOLK-LACHLAN-MOLESWORTH REGION
4-hectare hopground
road
railway
CONTOUR INTERVAL 100 METRES
SOURCE TAS LANDS DEPT AERIAL PHOTOGRAPHS
0 1 2
Km.



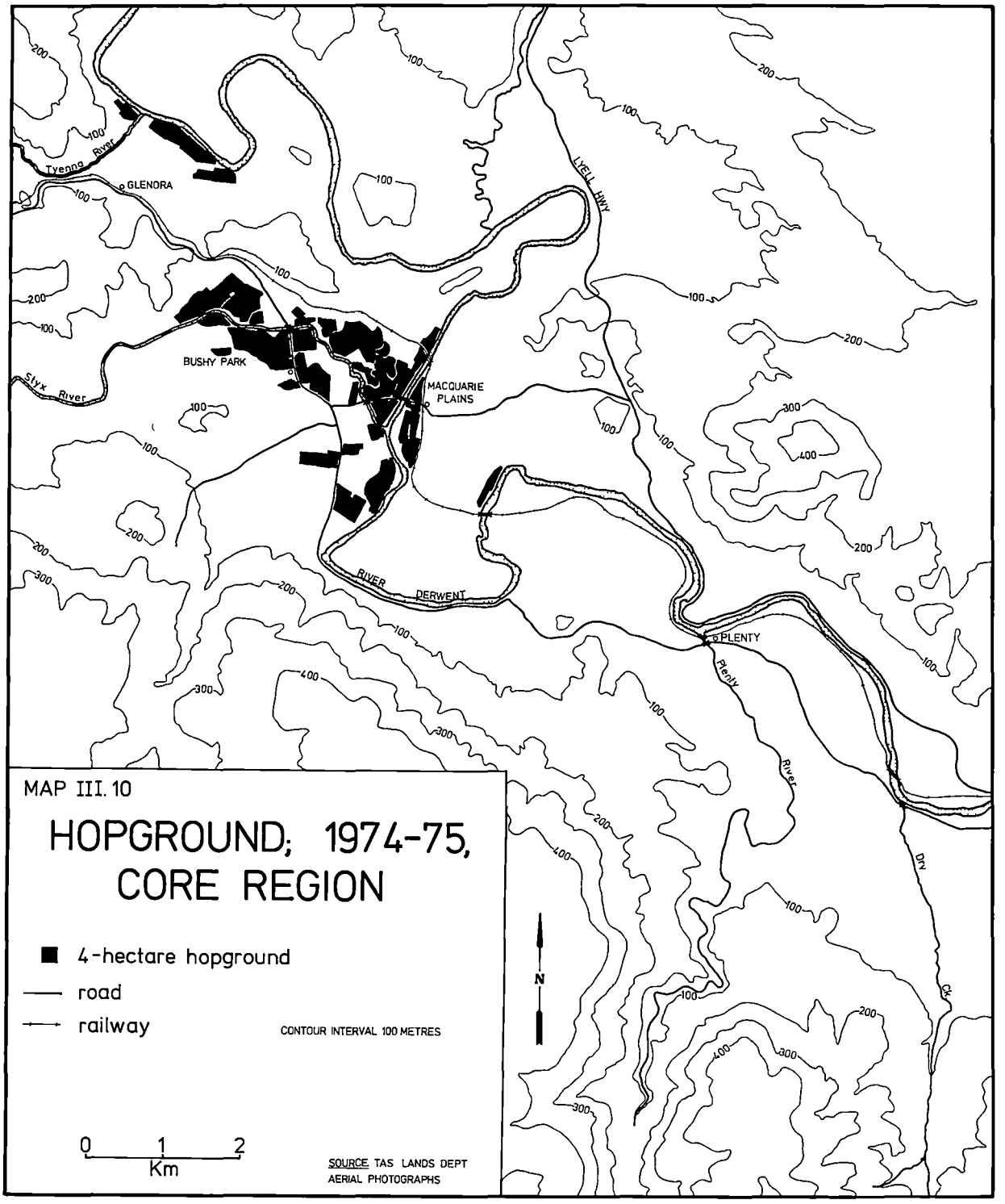

MAP III.9

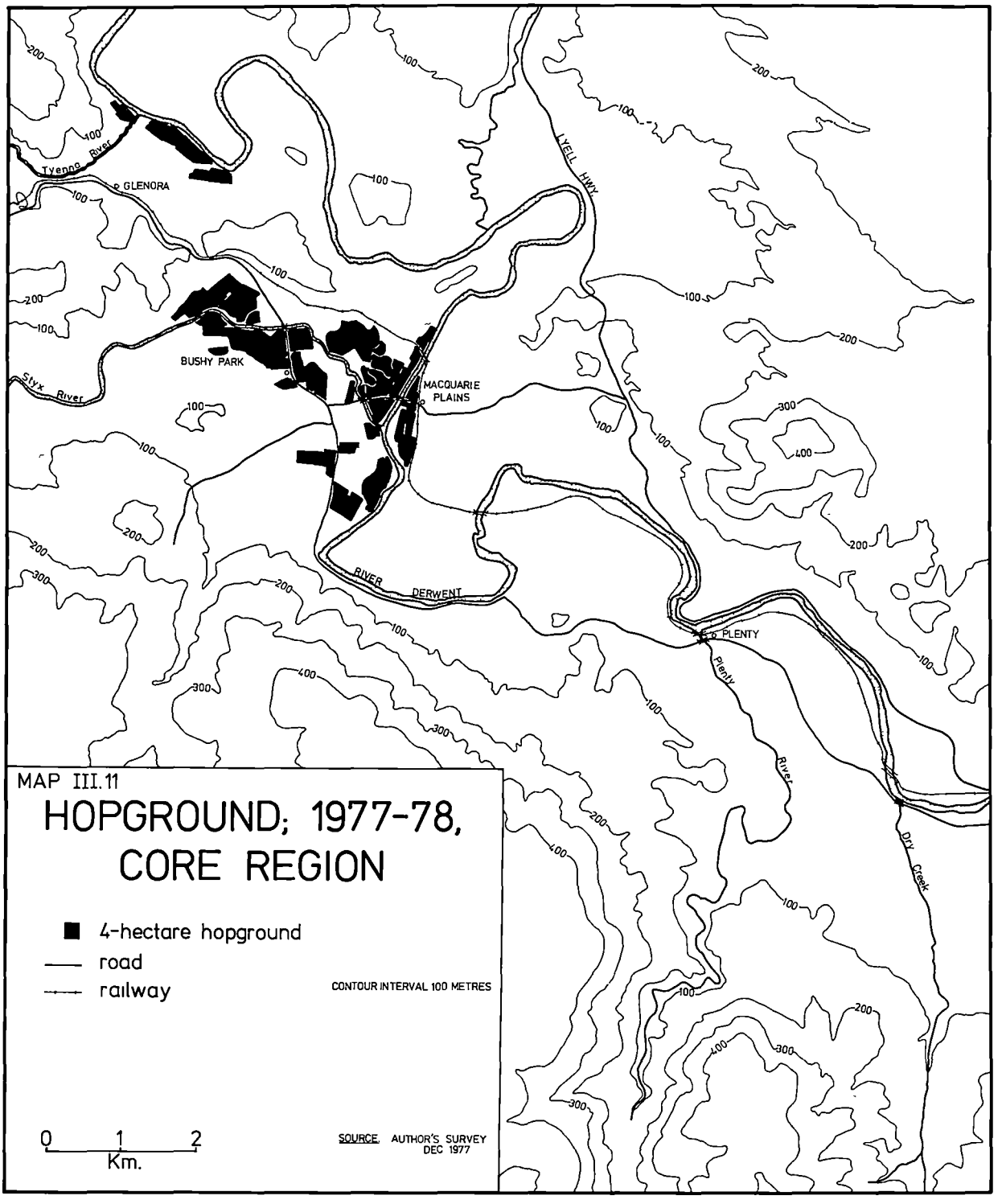
# HOPGROUND; 1977-78, NEW NORFOLK-LACHLAN-MOLESWORTH REGION

■ 4-hectare hopground
—— road
—|— railway

hectares in 1975 (see Map III.10) and 28.9 hectares in 1978 (see Map III.11). The total hop ground area of the region changed from 208.8 hectares in 1971 to 201.8 hectares in 1975, and is 202.3 hectares in 1978. It should be remembered that these figures are below the totals indicated by the A.B.S. because the official statistics include non-bearing area and because 'hop hectares' of 2965 hills of hops have been used to determine planted area on the basis that this method gives a more accurate indication of yields than does the use of simple ground area. There is the associated drawback with this method that the spacing of the hills varies between growers and that wider spacing may increase yields, but it is generally agreed within the industry that ground area is a less accurate measure than one derived by using the number of hop hills in the calculation.

The changes in distribution of productive area in the last five years are visually apparent from comparison of the 1965-66 regional patterns near peak production years in the Derwent Valley (Maps III.3; III.5; III.6) with their respective 1978 maps (Maps III.7; III.9; III.11). In 1965-66 planted area in hops in the north-east of the state was only a few hectares, and as recently as 1970 this region still constituted less than 6% of the total bearing area in the state (C.B.C.S., 1970). Maps III.1 and III.2 represent the extent of planted area in the north-east by 1976, and since that time only one grower has ceased production. This is the small hop ground on the highway immediately west of the Great Forester River at Tonganah. As there is otherwise no change in the entire region the maps have not been redrawn for the 1978 crop year. The north-east of the state represents over 40% of total bearing area in the state in 1978 compared with just over


Tyenna River
GLENORA
BUSHY PARK
Styx River
MACQUARIE PLAINS
LYELL HWY
RIVER DERWENT
PLENTY
Plenty River
Dry Ck
N
MAP III. 10
HOPGROUND; 1974-75, CORE REGION
4-hectare hopground
road
railway
CONTOUR INTERVAL 100 METRES
0 1 2
Km
SOURCE TAS LANDS DEPT AERIAL PHOTOGRAPHS


MAP III.11
HOPGROUND; 1977-78, CORE REGION
4-hectare hopground
road
railway
CONTOUR INTERVAL 100 METRES
0 1 2
Km.
SOURCE AUTHOR'S SURVEY DEC 1977
Tyenna River
GLENORA
BUSHY PARK
Styx River
MACQUARIE PLAINS
LYELL HWY
RIVER DERWENT
PLENTY
Plenty River
Dry Creek

36% in the core area at Bushy Park - Macquarie Plains.

In addition to the major relocation of a substantial portion of the hop industry in the last decade or so the question of structural adjustment to changing economic conditions should be considered. Clearly, surviving hop enterprises have larger hopgrounds in 1978 than was typical even five years ago, but they are also very different in terms of the relativities between factor inputs to what was typical a mere decade ago. The transformation should be seen as part of the revolution that is restructuring agricultural production throughout most of the developed world and in much of the developing world. With the increasing size of hop holdings in Tasmania it appears, as Gregor (1965) has shown, that hop production may be taking on some of the characteristics long considered typical of plantation agriculture. These include crop and areal specialization, highly rationalized cultivation and harvesting techniques, large operating units, management centralization, labour specialization, massive production and heavy capital investment. Not all apply equally well to hop production at present but as Gregor points out the plantation characteristics are no longer limited to low latitude regions with specific climatic and crop biases or dependence on cheap indigenous labour. Areal specialization can be seen in the consolidation of production towards the middle-Derwent core region and in the concentration of production in the north-east around Scottsdale-Tonganah. Some degree of areal specialization has always been typical of hop production as Harvey (1963) indicates, but with the addition of large centralized pelletizing plants at Bushy Park and Tonganah, the process seems to have become even more evident at the present time. Certainly the scale of operations involved in the large hop

farms represents capital inputs far beyond those found in the majority of agricultural types in Tasmania, particularly when inputs are considered in relation to unit area of production.

Despite the rapidity of change in the distribution of hop production since 1973-74, there appears to have been since 1976 a notable decrease in the rate of change in both grower numbers and planted area. The stability of the core region at Bushy Park-Macquarie Plains is particularly marked, as is the lack of change in the north-east. These two regions represent just over 76% of total planted area in 1978.

The final point pertaining to the present period of contraction is that the north-eastern region has been firmly established as a competitive production area to the Derwent Valley and that it clearly should be seen as a second core area. It has obvious advantages over the non-core areas in the south deriving from both the external environmental conditions and from the internal structural components of capital intensity and management expertise. It is not too far fetched to suggest that if further serious oversupply develops in the near future it may well be that the core area in the south will suffer the major portion of further reductions in planted area.

# CHAPTER IV

## REGIONAL ANALYSIS

### Introduction

The analysis of the hop industry to this point in the thesis, both in the historical context and in the contemporary period has tended to give general support to themes 1 and 3. Except in the case of the north-east, little has been said of the specific micro-regional variants which appear to have led to differences in the capacity of growers in different regions to survive - the specific concerns of theme 2.

The four sections of this chapter will again be concerned with all three themes but the specific focus of the first two sections - following an initial discussion of the data - will be on the micro-regional variations in physical characteristics and farm structure. Later sections consider the locational effects of hop-factoring and marketing as well as regional behavioural differences.

### Sample farm data

Data for the micro-regional analyses comes from four main sources: detailed interviews with present and former growers resulted in data on management, farm structure, hopground ownership, yields (sometimes for many years), and physical environment; the relevant section of the questionnaire (Appendix III) was completed by growers who had records of past production - where both this record and the number of hop hills were available and verified from other sources, the farms were included in the sample analyses; the records of all growers who sold through H. Jones

and Co., the leading hop factor, between 1952 and 1966 (some records were available until 1968); and finally, the Lands Department records of farm area devoted to hops (hop acres), other crops and livestock enterprises.

In a number of cases the yield details supplied by growers or former growers did not tally with the information on their sales through the hop factor, but as these growers were contracted to sell their entire crop through the factor it was considered that the factor records were the more reliable; in four cases the grower records were fairly consistently above the level of sales through the factor, and only in one year in the case of one grower did the factor appear to have sold more hops than the grower claimed to have produced. The latter situation may simply have represented an error on the factor receipt (these details were obtained from the duplicate copies of receipts actually issued to growers); the factor records were confirmed as accurate by 15 growers who had kept their own production records, in several cases years after they had left the industry. In each case, the details were accurate or tallied within a few pounds of the quantity of hops for which they had been paid by the factor.

To the 15 farms mentioned above, four others were added on the basis of the factor record alone; the number of hop hills of the farms was known in each case for the relevant production years - even where changes of bearing area or replantings had occurred - factor records showed individual loads delivered to the factor-owned kilns or in bales where growers dried their own hops. The final receipt for each grower contained a total weight for the season so that they were unlikely to have been in

error. Of the total of 19 farms selected for detailed yield analyses, all but three had ceased production by 1977. The latter three growers were interviewed on several occasions, and 14 of the former growers were located either on their former hop properties or elsewhere; of these, 12 completed the majority of the questionnaire as appropriate and where their records were available. In only a few cases were growers unable to supply most of the details on the number of hop hills, certain years when unseasonal weather conditions prevailed and the general profitability of their enterprise - the latter information being sought only in terms of 'satisfactory' or 'financially rewarding' and so forth (Appendix III). Two former growers were quite elderly, and apart from general questions on farm size and management the factor records and land valuation details were deemed sufficiently complete to include the farms in the analysis.

Of the 19 sample farms selected for yield analysis, prior to 1968 only three had purchased harvesting machines. These farms all had either large or medium-sized hopgrounds. By 1972-73 however, 17 of the farms were still in production and 11 had mechanical harvesters, the remainder being small producers who took their hops to the central, factor-owned kilns. Of those with harvesters, seven also sold their harvested hops green to the factor, the remainder drying their own. The factor records gave little detail on hop varieties, and as some growers had replanted to new varieties over a fairly extended period production could not be separated according to variety. However, the highest yielding hop, *ceteris paribus*, was the Golden Cluster, and grower records confirm that the majority of 'Cluster' was grown on the larger estates of the core; growers in peripheral local-

ities were persuaded to grow the straights, fuggles, white vine and other such varieties (Bradshaw, 1977). The difference in yield per variety would have been up to one bale per acre or about 270 kg. per hactare in extreme cases (Bradshaw, 1978), but the majority of medium and larger farms grew several varieties of hops in order to spread the harvest period, so the effect of varietal differences on farm yields would not normally be very significant.

Micro-regional yield variations; effects of physical environment

Of the 19 farms selected for the sample study, six were in the Westerway-Ellendale region, representing 17.3% of planted area and 14.6% of the region's growers in 1957. Although the land valuation records for the region were not available for 1952, all but one of the sample farms were verified as to planted area in that year during the field survey, and this farm was removed from the sample for the first five years. In 1957, mean size of hopground for the region was 2.42 hectares and in the six sample farms it was 2.88 hectares. Two of the farms were on the podzolic soils with elevated sites, and four were on alluvial A3-type soils (C.S.I.R.O., 1957) of the river valleys. In the case of the core region at Plenty-Glenora, six farms were included in the sample, and these covered 76.38 hectares or 26.6% of the 1952 planted area in the region and 35.3% of growers. Mean size of the sample farm hopgrounds was 12.73 hectares compared with a mean of 16.88 hectares for the region as a whole. The New Norfolk-Lachlan-Molesworth region had seven farms in the sample, occupying 30.14 hectares or 36.8% of planted area in the region in 1952. Mean planted area for the sample farms was 4.31 hectares compared with a regional mean size of 4.1 hectares. It should be borne in mind at this point that hopground size per farm unit bears little relationship to total farm size in terms of the area enclosed by farm boundaries.

The analysis of mean yields for the Westerway - Ellendale region from 1952 to 1966 inclusive indicates a mean dry weight yield on the sample farms of 2047.4kg. per hectare. The state average yield for the same period was 2125.2kg. per hectare. Thus the Westerway - Ellendale region appears to have a yield which was 3.7% below the state mean. The yield in the New Norfolk - Lachlan - Molesworth region for the same period was 2234.3kg. per hectare or 5.1% above the state mean and the core region had a sample farm mean of 2305.8kg. per hectare or 8.5% above the state mean yield for the period. The results for the three regions are summarised in Table IV.1:

TABLE IV.1

1952 - 1966 Regional Yields (Kg./HEC.)

| | Mean Yield | State Yield | % Variation |
|---|---|---|---|
| Westerway - Ellendale | 2047.4 | | - 3.7 |
| New Norfolk - Lachlan - Molesworth | 2234.3 | 2125.2 | 5.1 |
| Plenty - Bushy Park - Glenora | 2305.8 | | 8.5 |

Source: Jones, H. & Co. Records of Grower Returns

It seems clear from Table IV.1 that the core region had distinctly better growing conditions than the other regions, but the differences in yield due to varietal variations must be seen as having some influence in this regard and possibly sufficient influence to reduce yields to about the same as those in the New Norfolk - Lachlan - Molesworth region. It should also be remembered that the larger growers in the core region dried their own hops before weights were recorded, and these growers constitute 73.25 hectares of the 76.38 hectares of the sample farms in this region. All

growers in the Westerway - Ellendale region and five of the seven in the New Norfolk - Lachlan - Molesworth region sold their hops green, and the green-to-dry ratio of 4:1 constitutes a possible loss of as much as 4.75% in effective yield. Thus in relative terms the difference between the core region and the other two regions should be further reduced, so that it is quite questionable whether the core region actually yielded as well as did the New Norfolk - Lachlan - Molesworth region. This tends to confirm the view of a number of growers in the Lachlan and Molesworth areas who claimed that their yields had been the best in the state during the period and that this fact had been confirmed by different H. Jones and Co. hop managers, (Wilton, 1977; Bradshaw, 1977; Graham, 1977).

The analysis of regional variations in yield, however, particularly at the micro-regional level as in the present case, must also contend with wide variations in individual growers' yields. This point must relate to all forms of productive enterprise involving individual decision-makers who vary in their goals as well as in their accomplishments, and whose varying ability to contend with managerial decisions can raise questions which challenge the attempt to explain regional variations in terms of physical characteristics. Nevertheless, even in the case of the hop industry where all producers might be realistically regarded as profit maximizers, certain wide variations in individual performance seem to defy the constraints of the natural environment.

Certainly there are broad macro-environmental conditions which affect the hop yield. The general constraints of

latitude have been mentioned in Chapter I, and there seems no room for doubt that from the earliest times of the industry latitude has played a significant role. Even the general success of hop production in the Derwent Valley has sufficient international recognition due to latitude that Oliver (1957) comments on New Zealand hop production by comparing localities there from 41 deg.S to 41.5 deg.S. latitude with the Derwent Valley hop production area which lies between 42.5 deg.S. and 43 deg.S. It is also clear, as Pearce (1976) has shown, that different varieties of hops can be developed for different latitudes. Early English hops were well suited to Tasmanian and New Zealand latitudes despite the fact that they were lower than those of Kent, but these varieties did poorly in California. On the other hand, Californian varieties, crossed with English varieties and selectively bred at Ringwood in Victoria seem better suited to the slightly higher latitudes of Tasmania; although alpha acid content appears to be slightly lower than in Victoria actual tonnage per hectare more than compensates for this (Makeham, 1970; Davey, 1977). New Californian varieties have not succeeded in the higher latitudes of the Yakima Valley in Washington but are being grown under artificial lighting in Mexico to compensate for the shorter day length (Longbottom, 1977).

A second environmental variant which affects the yield of hops is soil. The soils of the Derwent Valley have been seen in Chapter II to have been less important in the early years of hop production than their actual elevation above river level and their suitability for irrigation. The latter having been satisfied, there is no doubt that the recent river alluviums

(A3-type soils on Maps I.2 and I.3) possessed advantages over other soils. The large expanse of A3-type "alluvial soils of high fertility, level surface, deep profile, and high water table" (Scott, 1961a, 237) in the core area at Bushy Park was well suited to hop production. It will be noted from Maps II.2, II.3 and II.4 that the hop producing areas of the Derwent and tributaries are almost entirely distributed on these soils. The exceptions consist of the scattered small areas of production in the hill country to the west of Fentonbury and around Ellendale. The latter hop grounds appear mainly in association with podzols and podzolic soils on siliceous sandstones (C.S.I.R.O., 1957). Drainage characteristics of these soils would be excellent, with little possibility of waterlogging.

Even within the river terrace soils there is considerable variation from a fine silt texture through clay to a very coarse river gravel or boulder-type soil in the upper Lachlan Valley. Hops reputedly yield better in the black clay soil of the floodplains (Bradshaw, 1977) but this is a more difficult soil to work. A grower who works the heavy boulder-type soil reported to the writer in 1977 that where the rocks were more frequent in his soil his hop yield was highest (Graham, 1977). It was observed in this particular field that space between rocks was often less than the size of adjacent rocks which varied in dimension from five cm. or so to thirty cm. or more. Apparently the structural condition of this soil, drainage characteristics and high water table due to an adjacent stream make it ideal for development of the roots of the hop plant (see Plate IV.1).

Apart from soils on which hops were produced at Kingston,

Plate IV.1
Soil type in upper Lachlan Valley - two views of fields owned by T. Graham.

Source: Author's photographs

remaining present and former hop producing areas have not been surveyed in detail for soil type. The Kingston soil is recent alluvium (Loveday, 1955), and from the writer's observations at Margate and Ranelagh it appears that soils in these hop grounds are similar although some krasnozem is evident in the former hop field at Margate. By contrast, a wide variety of soil types is used in the Scottsdale area. All growers in the region are located in tributary valleys of the Great Forester River or the Ringarooma River, or are actually on the flood plains of these rivers, but a number of the hop grounds do not have alluvial soils. Two have mainly krasnozem soils, one is on a podzolic-type soil and one has a remarkably coarse-textured river gravel which seems to sustain good yields. As in the Derwent Valley, the alluvial soils here vary also from rich black to brownish soils and coarse-grained siliceous soils.

Burgess (1964) has pointed to the fact that the hop plant is able to survive under remarkably poor soil conditions and that in England this has sometimes led to attempts being made to use second rate soils for its cultivation, resulting often in loss to the grower. It is certainly true that the yield of the hop plant is generally higher on the better soils, all else being equal. This point is supported by a number of growers in both the south and the north-east of the state who have mixed soils of varied quality and who report that similar cultivation techniques produce higher yields on the better soils. One of the main difficulties in attempting to analyse regional differences according to soil type is that it is a non-parametric variable and cultivation techniques also tend to vary from one locality to

another. There is also little doubt that factors other than soil type are of greater significance in determining year to year fluctuations in yield. When yields from varying sample farms from several regions within the Derwent Valley between 1946 and 1974 were compared, correlations of from .51 to .67 were obtained. However, attempts to identify significant differences in yields according to soil type, using a 'paired-T' analysis (Chase, 1967) revealed results which were below the critical 0.05 level of probability for rejection of the null hypothesis, and thus soil type could not be stated as being statistically significant as a determinant of yield variations.

One reason for the apparent lack of significant difference according to soil type is that the growers in the Ellendale region on the podzolic soils tended to have a very small area planted to hops and few other time-consuming enterprises on their farm units. They were able to devote more time to careful cultivation and care and attention to individual plants than was the case with larger hop growers, especially those employing paid labour. The net effect seems to have been a reduction in differences in yield due to soil differences. It is also evident that more pervasive phenomena such as weather conditions appear to be of greater significance than soil variations in affecting yield. This is seen particularly in the case of the smaller growers in the Lachlan region who also devoted much care and attention to each hop hill and yet whose long-run yields are not significantly higher than those of growers on the poorer soils.

Of the climatic elements, rainfall is still important

even with irrigation; nutrient availability in the growing stages seems to be improved if good rains fall. Temperature, however, is also of considerable influence. Burgess (1964) has analysed the correlations between alpha acid content of hops in England and various climatic conditions in the different months of the growing season. It is clear that the amount of direct sunlight falling on the ripening hops has an effect on the alpha acid yield. Both the alpha acid and soft resins content of the plant are also influenced fairly dramatically by temperature during the later months of the growing season and although there seems to be a slight inverse relationship between the rainfall in the later months of the season and alpha acid yield this is probably because of reduced sunlight in rainy years rather than directly due to the amount of rainfall.

Available meteorological data are inadequate for the detailed analysis of micro-regional variations in yield for all hop regions in Tasmania, but some general observations from the data will be of assistance. From Table IV.2 it will be seen that both temperature and rainfall are very similar for New Norfolk and Bushy Park, the latter locality being slightly more extreme in temperature range and having a marginally higher rainfall. Scottsdale seems to be broadly similar in temperature, having slightly lower maxima from September to March, possibly reflecting its slightly higher altitude. The real contrast is evident when Scottsdale's rainfall is compared with that of the southern localities. The north-east receives more than twice the average annual rainfall of either of the two southern localities, and the majority of this rain falls in the winter, spring and early summer - a substantial coincidence with the

TABLE IV. 2

MONTHLY TEMPERATURE AND PRECIPITATION MEANS IN THE NORTH-EAST AND TWO DERWENT VALLEY REGIONS

| | Jan | Feb | Mar | Apl | May | June | July | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BUSHY PARK | | | | | | | | | | | | |
| Mean Min. Temp. °C | 10.0 | 10.3 | 8.7 | 6.7 | 4.1 | 2.1 | 1.5 | 2.4 | 3.9 | 5.5 | 7.2 | 8.6 |
| Mean Max. Temp. °C | 23.8 | 23.9 | 21.4 | 17.8 | 13.5 | 10.8 | 10.3 | 12.2 | 14.4 | 17.1 | 18.5 | 20.5 |
| Mean Rainfall (mm) | 42 | 36 | 39 | 48 | 48 | 57 | 48 | 52 | 52 | 57 | 54 | 52 |
| NEW NORFOLK | | | | | | | | | | | | |
| Mean Min. Temp. °C | 10.6 | 11.5 | 9.6 | 7.2 | 4.8 | 2.3 | 2.0 | 2.6 | 4.6 | 5.8 | 8.2 | 9.7 |
| Mean Max. Temp. °C | 23.4 | 24.2 | 21.3 | 17.9 | 13.8 | 10.7 | 10.8 | 12.7 | 14.6 | 17.5 | 18.9 | 21.0 |
| Mean Rainfall (mm) | 38 | 36 | 36 | 50 | 44 | 49 | 47 | 47 | 48 | 56 | 47 | 51 |
| SCOTTSDALE | | | | | | | | | | | | |
| Mean Min. Temp. °C | 10.6 | 12.0 | 8.7 | 7.7 | 4.9 | 2.1 | 2.1 | 3.3 | 4.6 | 5.2 | 7.3 | 8.9 |
| Mean Max. Temp. °C | 22.5 | 23.6 | 21.0 | 18.0 | 14.7 | 12.0 | 11.9 | 12.2 | 13.9 | 16.0 | 17.6 | 20.1 |
| Mean Rainfall (mm) | 72 | 44 | 33 | 124 | 118 | 158 | 91 | 147 | 106 | 112 | 72 | 90 |

Source: Bureau of Meteorology.
(a) Climatic Survey Midland Region 4 Tasmania (1972).
(b) Annual statistics for Scottsdale 1966 - 1977.

period of maximum growth of the hop plant. The rain in the north-east then reduces in February and March, the crucial maturing and ripening period for the hop cones, the resultant increased sunshine having beneficial effects on the alpha acid content of the hops. Growers in the Derwent Valley readily agree that rainfall is preferable to irrigation water because it dissolves a greater quantity of soil nutrients (Ross, 1977). Although statistical verification of this point is not yet possible, the high yields of the north-east may well relate to this difference in rainfall. It is of interest that in the five months from August 1973 the total rainfall at Scottsdale was 570mm or about the average for a whole year in the Derwent Valley. This was the crop year referred to in Chapter III in which it was shown that yields for the north-east were above 3600kg. per hectare. In the early months of 1974, rainfall at Scottsdale was 81mm in January, 42mm in February, 25mm in March and 149mm in April. Thus the sunshine hours, although not appreciably greater than the mean over the four months were in fact over 36 hours above the mean in the two-month period of January and February, representing 7% more sunshine than the mean for the period. In 1973-74 then, the high rainfall early in the season, coupled with the above average sunshine later in the season appear to have combined to produce the high alpha acid content and good yield for the region in that year. It is of interest to note than when sunshine records are correlated with total yield the correlation is actually slightly negative, although not significant statistically. Only by detailed correlation of alpha acids or soft resins content of the hop with individual monthly sunshine and temperature data can a fair degree of precision be obtained as to

the most significant climatic influences, as Burgess (1964) has demonstrated. The problem in the case of Tasmanian hop production is that the alpha acid content has been analysed for only a few years and conclusions could not be established at the time of writing. Micro-climatic variations and loss of alpha acids due to incorrect timing of harvest or handling of the drying process are also such that much more detailed records taken virtually within the hop fields would be needed in order to achieve a satisfactory degree of precision.

In the case of the yields from the Derwent Valley for which data are available over a longer period of time, rainfall and total yield analyses revealed no significant correlation, and again total sunshine hours and yield were not significantly correlated. However, in the case of both the Bushy Park and the New Norfolk data for mean minimum monthly temperatures for the months of December to March, correlations with total yield for the crop year on several sample farms varied generally from .47 to .51 over a period of 19 years for which records were complete. These correlations were significant, lying above the critical 0.05 level of probability for rejection of the null hypothesis. Low overnight temperatures in summer months tend to be associated with anti-cyclonic conditions when cloud cover is absent. Temperatures are possibly low enough to reduce the rate of plant growth relative to warmer nights and showery conditions which are more common in some years than in others. Rainfall totals for the months in question are not significantly correlated with yield because rainfall in the earlier months of the growing season is more important whereas the ideal conditions in the summer months

appear to be those involving high temperatures and showery conditions (Burgess, 1964).

Wind is also a climatic element of major importance to hop producers and undoubtedly has influenced yields adversely in a number of years. Traditionally in England and Europe, as well as in Tasmania, hop grounds have been protected from the prevailing winds by rows of poplars, and these are still used in many hop grounds. Wind affects hops at all stages of their growth, blowing the bines off their strings or even breaking the tips of the bines in the early stages of growth, ripping or damaging the burs, bruising the fully developed cones and even shattering the fully developed lupulin glands, (Burgess, 1964). Wind can also ruin entire hop fields by blowing down the trellis system so that poles, wires and hops end up in a tangled mess on the ground. Hop growers have frequently sought to find localities with natural shelter from the wind, and the steep-walled valleys of the Molesworth and Lachlan areas in the Derwent were found to be ideal from this point of view. Bushy Park, Glenora and Macquarie Plains, on the other hand, being more exposed to the wind tend to suffer more wind damage. This is particularly due to the channelling effect that the Derwent Valley has on the prevailing westerlies (Bureau of Meteorology, 1972). Figure IV.1 illustrates the frequency and direction of winds at 9 a.m. and 3 p.m. for the area. This region also suffers the effects of katabatic air drainage from the highlands which also affects the Derwent Valley as far as New Norfolk but probably not the more sheltered tributary valleys.

Frost incidence and length of growing season are related variables which also affect the location of hop production and seasonal variations in yield. Because of the katabatic drainage

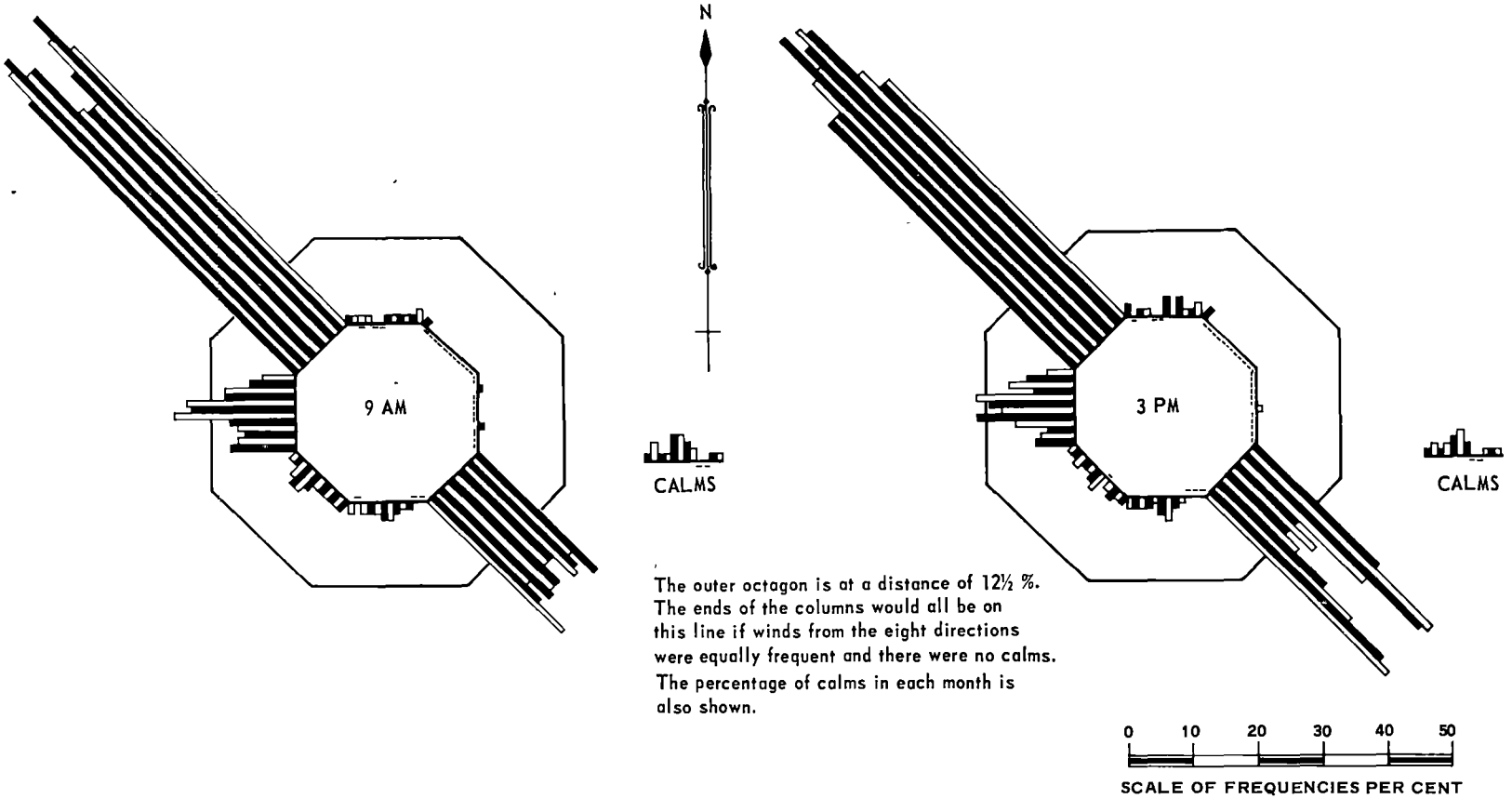



FIGURE IV.1 Bushy Park wind roses 9 am and 3 pm, 1931 - 1960 (based on 7253 observations of surface wind at 0900 hr and 5509 observations at 1500 hr)

Source: Bureau of Meteorology, (1972), 132.

of cold air from the central highlands, the onset of the growing season is slowed in the upper reaches of the Derwent Valley, and even at Bushy Park frosts can be expected from late March (Bureau of Meteorology, 1972); such frosts may well have adverse effects on the mature crop. At least one grower was sufficiently aware of the problem that he regularly turned on his overhead irrigation system during the early hours of the morning when frost was expected, to raise the general humidity level of the hopground and thereby insulate the crop to some extent against frost damage (Milton, 1977).

Some indication of the broad macro-environmental influences on yield can be gained from examination of the year to year fluctuations in total yield (Pearce, 1976; C.B.C.S. annual industry statistics), but apparent low yields in a given year may not always result from seasonal conditions. Localized catastrophic conditions such as floods in a major producing locality may effectively reduce total yields in what was a good season for growers in other localities. In addition, in 1978 it was pointed out to the writer by one grower that when his vines were blown off their strings he avoided the additional labour costs involved in re-tying them in view of the current market situation; further labour inputs, he said, would produce higher yields. This, in turn, would add to the current oversupply, possibly further depressing prices (Bradshaw, 1978). This grower has 5% of the state acreage in hops, but his attitude did not seem to be widely shared.

Despite the foregoing, the goal of the hop producer must still be that of profit maximization; because of the high-cost inputs involved, most growers in most years have had to achieve maximum profits, which usually has meant maximum output.

As an indication of the broad seasonal variations which clearly have had some effect on each region, yield figures for the 19 sample farms in the three Derwent Valley regions from 1952 to 1966 are correlated as follows:- Westerway-Ellendale and Bushy Park core region, .72; Westerway-Ellendale and New Norfolk Lachlan-Molesworth, .73; and Bushy Park core and New Norfolk-Lachlan-Molesworth, .76. These results are highly significant and when verified with the Student's T-test (Chase, 1967) lie well within the critical 0.05 level of probability for rejection of the null hypothesis. Respective coefficients of determination for the three regional pairs were .52, .53 and .58. Clearly, the influence of broad seasonal conditions affecting the whole of the Derwent Valley is paramount, but a significant amount of residual variation in yield between the sample farms in the three regions seems to be a function of either local seasonal conditions or of variable practices by individual farmers; variable inputs of fertilizer would be a case in point. This degree of significance for local causal relationships at the level of the individual farm or at the micro-regional level is deserving of much greater attention by geographers because such differences between very small regions may well be obscured in the aggregation of broad macro-statistics.

Of the 19 farms which constitute the detailed farm yield analysis in the three regions of the Derwent Valley, yield correlations between pairs of farms ranged from .35 to .9. Values were generally lowest between farms in the core region and those in the Westerway - Ellendale region, and highest between farms in the same region. In each of three cases where correlations were

above .8 the farms in question were in the same region, and although in two cases the environmental conditions could not readily be differentiated between the farms, in one case they were clearly different. This was the case of two farms in the Ellendale area, each of which had only 1.01 hectares of hops for the period in question. The farms were separated by less than one kilometer but one was in a sheltered valley floor on river alluvium and the other was on a podzolic soil on a hillside. This was the highest correlation obtained for all pairs of farms, and is interesting also because of apparent performance reversals which appear to occur coincidentally with a prevalence of anti-cyclonic weather conditions during the later months of the growing season. These conditions can be confirmed by examination of records of sunshine hours and minimum daily temperatures for Bushy Park. The mean yield for the hops grown on the valley floor was 2,549kg. per hectare and for those grown on the hillside it was 2,312kg. per hectare. The standard deviation for the hillside hops was higher however, at 884kg. compared with 583.9kg. for the valley-floor hops. In years when wind was not a problem, as confirmed from interviews of the two growers, the yield on the hillside farm was generally greater than that on the valley-floor farm, and thus raises the question as to why this situation could occur. It has been established from interviews of the farmers in question that both were attempting at all times to maximize yields. In view of the earlier correlation of yield and minimum temperatures during December to March, it is the view of the writer that temperature inversions occur in the valleys around Ellendale, just as they are known to occur in the lower and middle Derwent due to katabatic air drainage. The hills to the west of Ellendale

on which one of the two sample farms in question was located, actually form the eastern flank of the Mt. Field massif, and in years when relatively stable anti-cyclonic air masses predominate over the state wind damage to hops would be minimal and temperature inversions affecting valley-floor hops maximal. However, the need is for much more detailed study of such micro-climatic elements before conclusions can be adequately verified.

The analysis of regional differences within the Derwent Valley as a whole would have been greatly assisted by the availability of climatic data for each locality such as Ellendale, Fentonbury, Westerway, Lachlan and Molesworth; but it is quite apparent from the data that are available that no one single environmental element, whether soil, rainfall, temperature or sunshine is uniformly significant in all years. Certainly, winds affect all growers in some years and hillside growers are affected more adversely than are valley-floor growers. All hops are susceptible to frost and appear to be adversely affected by low overnight temperatures during the growing months, possibly cancelling out some of the advantages of excellent river alluvium on which the majority of the Derwent Valley hops are produced.

The important point from this discussion of yields however, is that the easy assumptions that are sometimes made from macro-scale analyses of spatial relationships in agricultural geography may lead to pitfalls for the unwary. Because, for example, hops are grown on the river alluvium in the Derwent Valley, it is all too easy to associate a deterministic cause and effect relationship. Two dissimilar environments may produce similar long-run yields, though conditions which suit one may cause

a loss in the other and vice-versa. Only by examination of individual farms and decision-makers can anomalies such as the extraordinarily high yields of one small grower in the Lachlan region be identified. This grower was originally rejected from the sample farm analysis because it was felt that an error had occurred in computing his yields. When further investigated, it was found that he did in fact produce from 60% to 80% more hops per hectare than did his neighbours because he had discovered an accidental hybrid hop variety which gave extraordinarily high yields. The farm was still excluded from the sample farms for the region because it was atypical. Unfortunately, this particular hop, the Coleman Special, had a low alpha acid content and was phased out with the introduction of high-alpha acid hops. It would be all too easy, for example, to attribute the excellence of the Lachlan and Molesworth areas for hop production to the fertile alluvial soils and sheltered valleys of the region but it is quite possible that one of the main attributes of the region is that it receives relatively little cold air drainage. This possibility, however, may emerge only as a result of detailed study of other localities where air drainage is found to reduce yields. Relative gains in yield may also accrue to regions such as the Lachlan, Molesworth or Ellendale regions because of environmental calamities such as floods which destroyed 28 hectares of hops at Glenora and Bushy Park in 1960, (Bureau of Meteorology, 1972). It seems clear therefore that spatial processes and patterns of agricultural land use must be analysed by study at the level of the individual farm and the micro-region if adequate theory of the spatial arrangement of agriculture is to be developed. This involves not only the environmental controls and productivity

levels of farms and regions but also the internal economic structure of farms and the type of management decision-making that together combine to affect both processes and patterns in the economic landscape.

Farm structure analysis

The capacity of hop producers to survive in periods of decline within the industry appears to be related to the degree of internal diversification of the farm unit, and to the entrepreneurial structure of the farm enterprise. Since 1945 there have been marked declines in the area planted to virtually every major crop in Tasmania except hops, and a general shift towards livestock enterprises (A.B.S., 1976a). Hop producers who in the 1950's had other crop enterprises and livestock have generally specialized to an increasing extent in hops, or in hops and livestock, with the major source of income being from hops, so that declines in planted area and grower numbers since 1968 reflect the large proportion of hop farms which have ceased to function as commercial enterprises.

Increased specialization of farming is a trend throughout the commercial world (Weller, 1967; Papi and Nunn, 1969), and increased size of hop farms with associated higher capital inputs have been documented in England by Pocock, (1959) and Harvey (1963) and in Australia by Pearce, (1976). In the decade since 1968, grower numbers in Tasmania have declined from 111 to 22, a decline of 80%, but planted area has declined by only 8.5% from 608 hectares to 565 hectares (A.B.S., 1978).

Of a sample of 84 hop farms surveyed in Tasmania by

Makeham (1970), 60 were found to derive more than 91% of gross farm income from hops (Table, IV.3), and a further 10 farms derived from 76% to 90% of gross income from hops. Only six farms were found to derive less than 50% of their income from hops. Thus any attempt to analyse diversification of farm income by hop growers is really concerned with a relatively small amount of income for most producers. However, within the Derwent Valley,

TABLE IV.3

DEPENDENCE OF TASMANIAN HOP GROWERS ON HOP INCOME

| Area of Hops (Hectares) | Less than 50% | 50-75% | 76-90% | 91%+ | Total |
|---|---|---|---|---|---|
| 0 - 2.02 | 5 | 2 | 4 | 24 | 35 |
| 2.03 - 4.04 | 1 | 3 | 4 | 19 | 27 |
| 4.05 - 8.08 | | 2 | | 9 | 11 |
| 8.09 - 20.2 | | | 2 | 5 | 7 |
| 20.21+ | | 1 | | 3 | 4 |
| | | | | Total | 84 |

Source: Makeham, (1970, 12).

the variation in crop and livestock enterprise combinations again reflects regional differences of the type seen in relation to farm size.

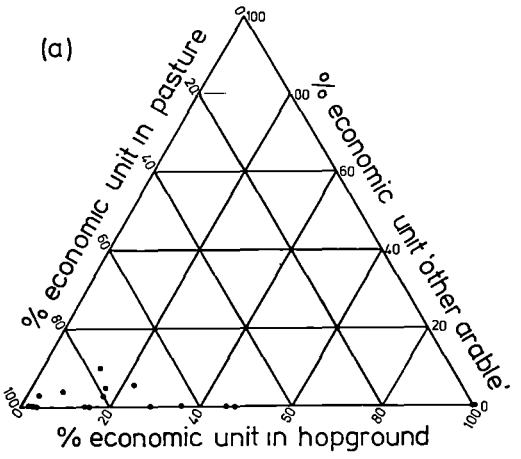
Lands Department valuation records for the periods 1952 - 1975 in the case of New Norfolk - Lachlan - Molesworth and Bushy Park - Glenora, and for 1957 - 1975 for the Westerway - Ellendale area, have been used to derive simple areal extent of each cash crop enterprise and the portion of each farm devoted to livestock raising. It is not possible with this method to derive meaningful equivalents for crop and livestock combinations as Coppock (1964) attempted by using man-hour equivalents in the case

of British Agriculture. Scott (1957) applied a composite approach using Weaver's (1954) crop combination methods and a livestock ranking of police districts when quantifying the agricultural regions of Tasmania, but the methods are not appropriate for analysis of individual crop types such as hops without inclusion of all crop types and farms in each region in the study. The percentage of productive farm area occupied by the activities of hop production, other cash crops and livestock activities have been graphed on a triangular graph (Toyne and Newby, 1971) where each farm is located with reference to the three axes. The value of the method is that it shows relative changes over time in the extent of diversification of hop farms, and differences in farm structure of hop units between the three regions of the Derwent Valley. Detailed field work has been carried out within the regions so that additional information is available to assist interpretation of the triangular graphs.

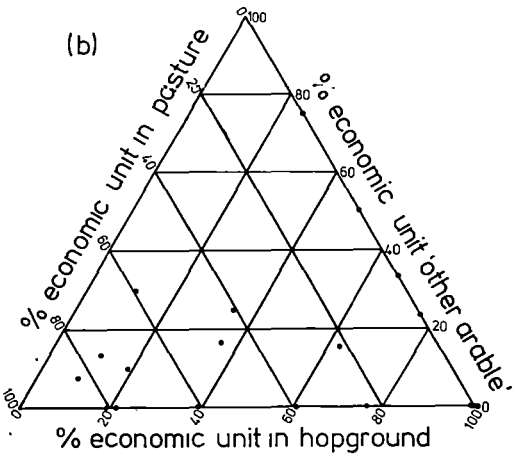
In the core Plenty - Bushy Park - Glenora area in 1952 all but two farms had less than 50% of their area under hops (Figure IV.2a). This reflects the fact that the larger hop producers had very extensive pastoral activities; two farms operated sizable dairy herds; others raised sheep or cattle. Over half the farms in the core region had only hops and pastoral interests, but orcharding was an important activity for three of the larger units. Two very small farms had only one acre or two under hops with no other commercial activity, and smallfruits were confined to relatively peripheral farms along the Glenleith Road. One larger farm combined sheep and cattle raising with dairying and hops. Map IV.1 (Scott, 1965) indicates the substantial holdings of orchard in the region in 1953 and when compared with

FIGURE IV.2

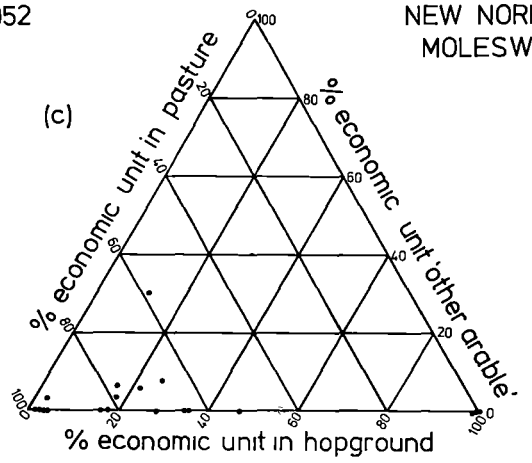
# REGIONAL FARM UNIT-AREA ANALYSIS




CORE REGION, 1952

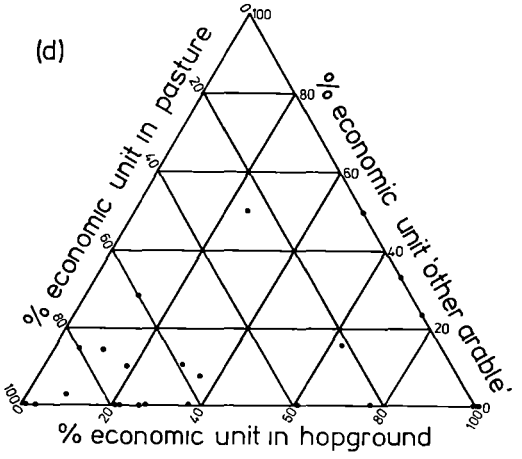



NEW NORFOLK-LACHLAN-MOLESWORTH REGION, 1952

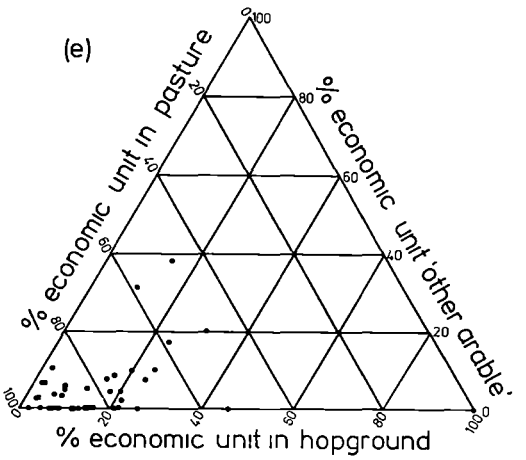



CORE REGION, 1958

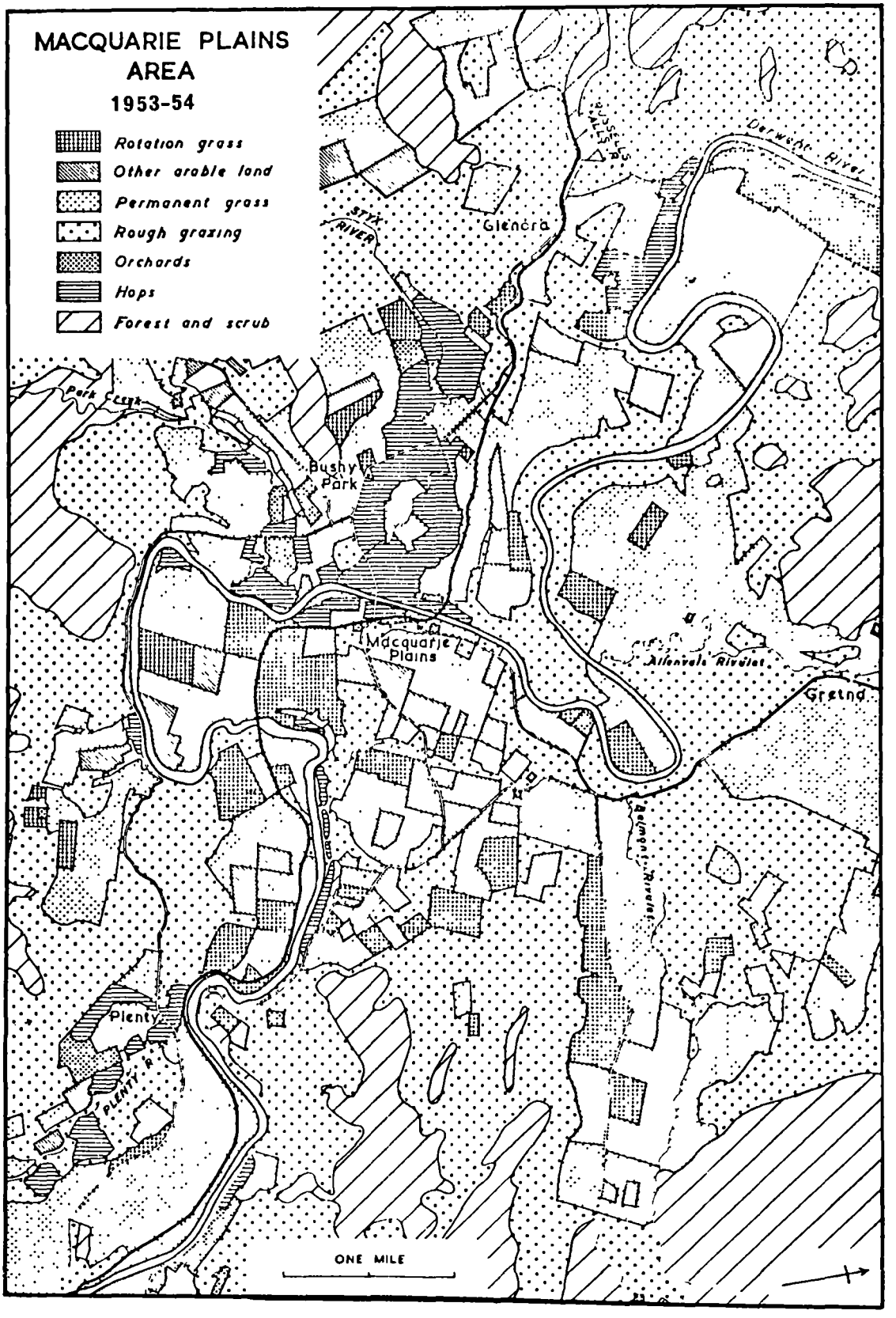
SOURCE TAS LANDS DEPT




NEW NORFOLK-LACHLAN-MOLESWORTH
1958




WESTERWAY-ELLENDALE
1958




MAP IV.1

Source: Scott, (1965) 8.

the Westerway - Ellendale and New Norfolk - Lachlan - Molesworth areas (Maps II.5, II.6) the larger average farm size and size of crop specialty holding in the core region will be readily apparent.

Specific farm valuation data for 1952 in the Westerway - Ellendale area were not available, but it is clear from the 1953 survey by Scott (1965) that there was considerable diversity in the area, particularly around Ellendale, with small fruits grown in scattered plots on the hillsides and hops confined either to the valley floors or to more dispersed hillside locations. From the 1957-58 valuation data for this region it is evident that farms were less diversified than those in the Lachlan - Molesworth area, having generally higher proportions of total area under livestock raising. It can be seen from Figure IV.2a-b that when compared with the core region, the New Norfolk - Lachlan - Molesworth region had considerable diversity in 1952. Four farms in this region had no activity apart from hop production; seven farms of the total of 20 had a mix of other arable and pastoral activities, and four farms had other cash crops in addition to hops but no pastoral activities. In addition, it is evident that the percentage area of farms in this region occupied by hops was higher than that of the Westerway - Ellendale area, reflecting both the larger mean size of hop ground and the relative scarcity of grazing area in these valleys where virtual rock walls rise steeply from valley floors in a number of places.

By the 1957-58 valuations, apart from increased numbers of hop growers in all three areas, the relative differences between the three variables show little perceptible change (see Figure IV.2c-e). By far the greater number of diversified farms

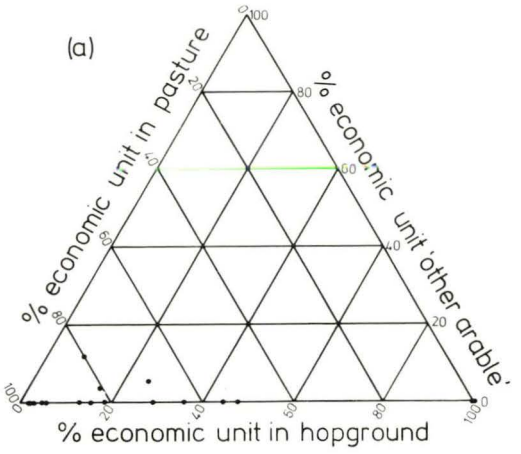
was located in the Westerway - Ellendale area but the degree of diversification on individual farms was more pronounced in the New Norfolk - Lachlan - Molesworth area. However, by the 1965-66 land valuations the number of farms lying within the axes of the three land use categories had declined in all three regions.

The Bushy Park - Glenora area lost two hop producers between 1958 and 1966, but it suffered a greater reduction in the number of holdings with orchards; from six farms to three. This included the loss of one substantial orchard of over 19 hectares (see Figure IV.3a). The Westerway - Ellendale region suffered a loss of the small fruit production on four hop farms in the period although the number of hop producers in the region increased by five. In the same period, a substantial reduction of small fruit holdings occurred in the New Norfolk - Lachlan - Molesworth region so that in 1966 only seven hop farms had other cash crops, compared with 12 in 1957-58 (see Figure IV.3b-c).

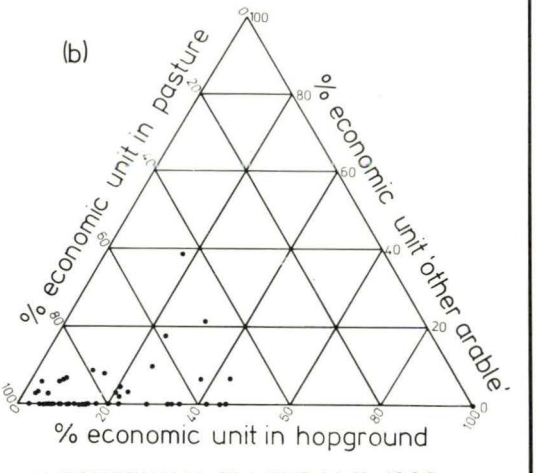
By 1970-71 the loss of other cash crops was most marked in the Westerway - Ellendale area with the halving of the number of producers in the region (Figure IV.3d); of particular interest is the survival of producers for whom hops constituted the smaller proportion of total farm area. It appears that growers who also had extensive livestock interests were able to survive the relative price decline referred to in Chapter III; producers dependent more heavily on hop income ceased production earlier. Also evident by this time is the substantial decline in diversified farms in the New Norfolk - Lachlan - Molesworth region, and to a smaller extent in the core region (see Figure IV.3e-f).

FIGURE IV.3

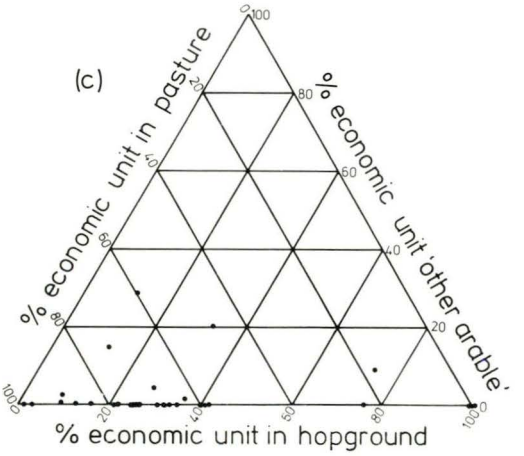
# REGIONAL FARM UNIT-AREA ANALYSIS



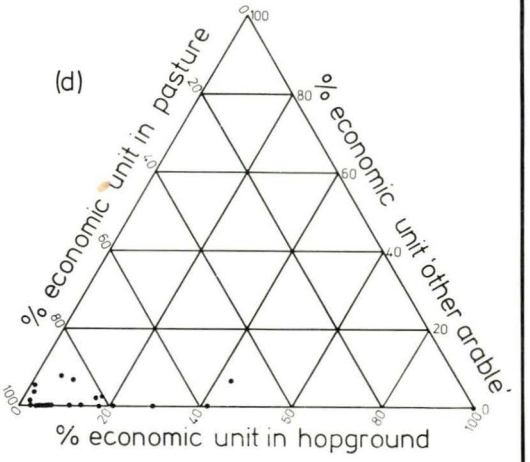

CORE REGION 1966



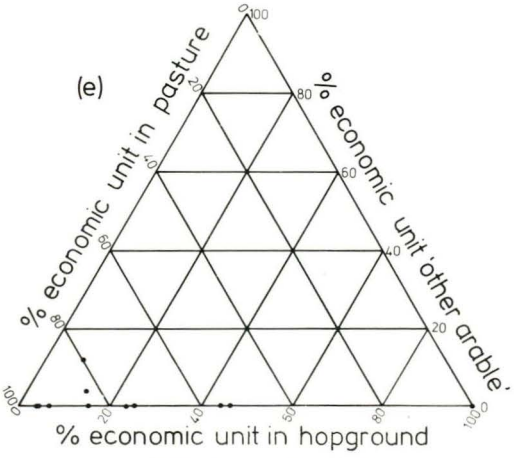

WESTERWAY-ELLENDALE 1966



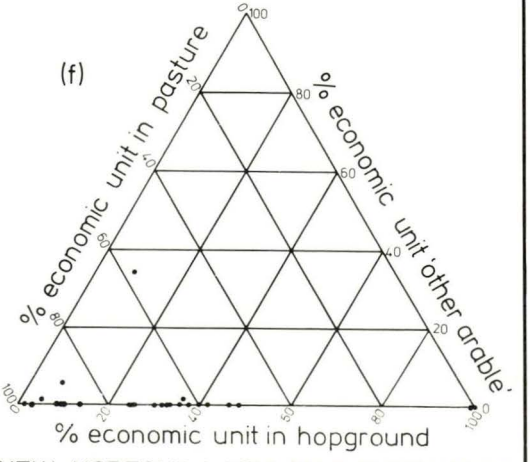

NEW NORFOLK-LACHLAN-MOLESWORTH 1966




WESTERWAY-ELLENDALE 1971




CORE REGION 1971




NEW NORFOLK-LACHLAN-MOLESWORTH 1971

SOURCE: TAS. LANDS DEPT. RECORDS

It is clear from the analysis to this point that the post-war decline in specialty crops identified by Scott (1961a) has continued, with the area planted to hops moving against the trend. Very few hop farms with diversified cash crop activity have survived to this point, the majority of hop growers having grazing interests; several producers operate dairy farms on which hops constitute a significant portion of income. These conclusions support the results of the Makeham survey (1970) which classified hop farms into four categories according to their capacity to diversify away from heavy dependence on hop income. Of the total, 41% of growers had farms which offered no opportunity to earn a living other than from hop production:

> "they are either parcels of steep bush land with areas of alluvial flats or very small farms where hop lands make up the bulk of the farm area. This group includes several large hop farms where alternative farm income would be less than 5% that derived from hops" (Makeham, 1970, 13).

The second category involved growers who had some capacity to diversify to other activities but it was noted all would suffer a substantial lowering of growers' net income. In all, 93 of the 104 growers in the state at the time fell into one or other of these categories. Of the remaining 11 properties, several were large diversified farms which could be regarded as having adequate income without hop growing; although hops constituted over 50% of income on most of these properties. The remaining properties fell into category IV which involved hop gardens owned by companies who have other commercial interests; it was noted that none of these companies would be forced out of business if hop growing were eliminated despite the fact that hop growing is

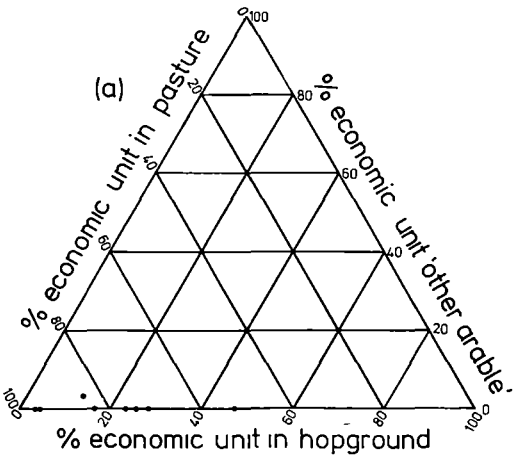
profitable for them.

From Figure IV.4 it is evident, however, that with the decline in grower numbers subsequent to the Makeham Report, it was not the large company holdings which ceased production. The core region properties remained little changed by 1975, and have changed very little since then. By contrast, production in the Westerway - Ellendale region all but vanished during the early 1970's, and only 15 producers remained in the New Norfolk - Lachlan - Molesworth region by 1975. This number has declined to six in 1978 crop year. Many of the former producers in the areas peripheral to the core region blame the leading hop factor for the lack of sales for their hops after the 1973-74 crop year; the point was made as early as 1970 that factors who were also growers may be seen to be involved in a conflict of interest in times of oversupply of the market (Makeham, 1970). In fact, it is clear from the writer's survey (1977) of growers who presently constitute the Australian Hop Marketers Association that prior to 1974 the hop factor's own hops were sold on the domestic market before the hops from smaller producers were sold; when oversupply of the domestic market arose, the smaller producers could receive either a much lower export price or could find themselves waiting with hops in storage until the domestic market improved. In some cases there was no sale available for small producers' hops and they were forced out of business.

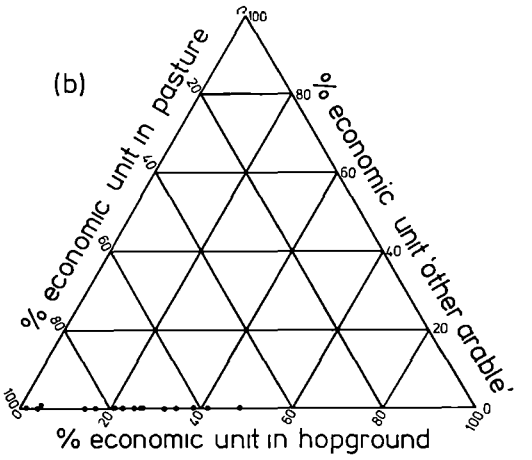
Only by examination of the costs of production of hops can the full impact of the current market oversupply on the changing enterprise structure and spatial distribution of the industry be seen. There have been, within the last decade or so,

FIGURE IV 4

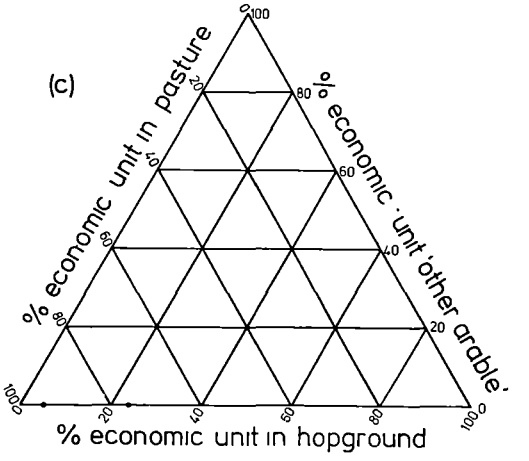
# REGIONAL FARM UNIT-AREA ANALYSIS




CORE REGION 1975




NEW NORFOLK-LACHLAN-MOLESWORTH 1975




WESTERWAY-ELLENDALE 1975

SOURCE TAS LANDS DEPT RECORDS

three main inquiries into costs of production, the first of which was carried out on behalf of the Hop Producers' Association of Australia in 1966, in order to "examine the practical application of the formula agreed upon in 1949 for the purposes of annual adjustment of hop prices payable to producers" (Shield & Hibbard, 1966, 1).

This report examined in detail returns to capital, labour and materials for three large growers whose major income was from hop production. The three growers were found to have suffered a price lag of about 15 cents per kilogram of hops produced over the five-year period from 1962, despite the fact that their sample farms together averaged over 8% higher yield than the state mean yield during the period. This loss was after allowing an annual working manager's salary of $4000 and a return on capital invested at 8.5%. However, the period involved in the study included the disastrous 1964 season with the lowest yield for several decades. The general price lag between 1952-53 and 1965-66 can best be illustrated by reference to the prevailing hop prices and the consumer price index for the period (see Table IV.4). This shows that from 1953 to 1966 the price lag relative to overall costs in Hobart was in the order of 17 cents per kilogram. More interestingly, the larger growers were in the process of mechanization of harvesting during the period, and reduced labour costs on the sample farms were found to be 21.63 cents per kilogram less 5.13 cents for increased indirect costs and administration and 0.8% return on capital. Smaller growers, of course, would not have had the benefit of this cost saving and thus the relative price decline for them would have been felt

most severely.

TABLE IV.4
HOP PRICE RELATIVITIES 1953-1966
Consumer Price Index

| | 6 Capitals | Hobart | Hop Prices (cents/kg.) | Index |
|---|---|---|---|---|
| 1952/53 | 100.0 | 100.0 | 121 | 100 |
| 1953/54 | 102.0 | 105.0 | 121 | 100 |
| 1954/55 | 102.6 | 104.9 | 121 | 100 |
| 1955/56 | 106.9 | 110.2 | 121 | 100 |
| 1956/57 | 113.1 | 116.9 | 126.5 | 104.5 |
| 1957/58 | 114.2 | 117.0 | 130.2 | 107.6 |
| 1958/59 | 116.0 | 118.7 | 132 | 109.1 |
| 1959/60 | 118.9 | 120.8 | 137.5 | 113.6 |
| 1960/61 | 123.8 | 127.5 | 137.5 | 113.6 |
| 1961/62 | 124.3 | 128.1 | 143 | 118.2 |
| 1962/63 | 124.5 | 128.0 | 143 | 118.2 |
| 1963/64 | 125.7 | 129.4 | 143 | 118.2 |
| 1964/65 | 130.4 | 133.6 | 150.3 | 124.3 |
| 1965/66 | 135.2 | 138.3 | 150.3 | 124.3 |

Source: Shield and Hibbard, 1966, 7.

By 1969-70 when the Makeham survey was conducted, the pace of structural change within the Tasmanian hop industry was increasing; new varieties were being planted, the advantages of scale economies were becoming apparent with the advent of mechanization, and many smaller growers had already ceased production. This report surveyed in detail a large number of growers in Tasmania and concluded that despite the range of managerial skills in the industry and undoubted returns to scale as illustrated in Table IV.5, the most important factor in the economic structure of the industry is the yield:

> "over two thirds of growers' costs are virtually insensitive to yield. That

> is, whilst they are 'variable' costs in that they can be altered from year to year, they do not alter with the size of an industrial crop"
>
> (Makeham, 1970, 77).

Thus growers' returns to capital will vary from year to year dependent on size of crop and assuming that price remains constant with cost increases. This point is clear indication

TABLE IV.5

CAPITAL EMPLOYED AND RETURNS TO CAPITAL BY SIZE OF HOP UNIT

| | Large Garden 12 Hectares or More | | Medium Garden 4-12 Hectares | | Small Garden 0-10 Hectares | |
|---|---|---|---|---|---|---|
| Capital per Hectare ($) | low 7689 | high 8850 | low 8149 | high 10551 | low 9466 | high 9907 |
| Returns to Capital | 14% | 3% | 11.2% | -1.18% | 3.8% | -3.4% |

Source: Makeham, 1970, 77.

as to why growers in areas such as the Westerway - Ellendale area where yields tended to be lower than the state average would suffer relative to producers in more favoured localities. However, the Makeham Report also pointed out that while the smallest farms had the poorest average level of management skill there were some capable and profitable producers in this category. Returns to labour were found to be poorest in the farms below 4 hectares and randomly distributed against size above 4 hectares. The most outstanding size category for labour efficiency was found to be the 4 - 8 hectare group. However, small farms could not justify mechanical harvesters even of the smaller variety, and the overriding point remains that "returns to scale improve at least up

to 20 hectares" (Makeham, 1970, 76). The major reason for this is the high capital investment in the semi-manufacturing processes of mechanical harvesting and drying.

The most recent comprehensive report on hop production costs and the economic structure of the industry (McColl, 1974) employed a random sampling technique to select 38 growers from Victoria and Tasmania who produced hops in the 1972-73 crop year. Grower's records, hop factor records and records of the growers' accountants were used in order to separate hop production costs from other farm enterprise costs, and detailed field work was also employed to verify results. In the Tasmanian case, 24 of the state's 64 growers were included in the sample which was further subdivided according to level of production as follows:

TABLE IV.6

SIZE DISTRIBUTION OF SAMPLE GROWERS 1973

| Production Size in lb Dry Weight | No. of Growers in Group as at 1973 Harvest | No. of Sample Growers in Each Group |
|---|---|---|
| Less than 20,000 (9,090kg.) | 37 | 13 |
| 20,000 - 100,000 (9,090 - 45,455kg.) | 17 | 7 |
| Over 100,000 (over 45,455kg.) | 10 | 4 |

Source: McColl, 1974, 8.

The main difference between this report and the Makeham Report (1970) is that it attempts to determine a cost of production figure without including return on capital employed. It is argued here that above a certain capitalization rate automatic increases in land values will occur as buyers attempt

to purchase hop growing land and thereby bid up its price. In turn, the higher land values will then be capitalized into a new cost of production, with the cycle repeating itself, (McColl, 1974). It was pointed out however, that a capitalization rate has to be chosen when attempting to establish actual costs of production, but it should be such as to neither attract new entrants nor encourage existing growers to expand, unless of course it is generally desired to expand the industry.

This report also deals with recent improvements in yield by noting that actual yields have not increased to the extent that many growers believe they have as a result of the new hop varieties. The point is made that running average yield figures need to be employed in order to smooth out the year-to-year effects of weather and disease. Harvey, (in Chorley et.al., 1967) also makes this point, and Pocock (1959) employed the method to demonstrate the extent of increasing yields in Britain in the period up to 1960. Scott (1961a) comments on the fact that yields in Tasmania had apparently shown the reverse trend to that in Britain, but both Scott (1961a) and McColl (1974) pointed out the difficulties of obtaining precise yield data due to over-statement of planted area by growers or claims of high yields for whole farms when only a few portions of the hop ground produced well. The points made previously in relation to errors by the Commonwealth Bureau of Census and Statistics in compiling yield data also need to be borne in mind, but a three-year average yield from 1971-72 to 1973-74 for Victoria and Tasmania of 2223.9kg. dry weight per hectare was used as a standard for calculating costs of production. Because Victorian yields tend to be lower than Tasmania's by from 12% to 26%, the Tasmanian

growers gain in terms of yield when costs are being determined, but many overhead costs vary between the two states generally to Victoria's advantage.

The cost of production figure arrived at by the McColl Report for 1973-74 crop year was 163.88 cents per kilogram dry weight for Australia as a whole, with the three size categories of farms in Tasmania having costs ranging from 149.62 cents for units producing over 45,455 kilograms (100,000 lb.) to 165.64 cents per kilogram for units producing 9,090 - 45,455kg. The smaller units, producing under 9.090kg., had costs of 160.36 cents per kg. but it must be remembered that scale economies would adversely affect these growers when computing the returns to capital employed. An example of capital investment for a typical 12 hectare farm was detailed and showed total capital invested per hectate of $13,467 as indicated below:

TABLE IV.7

CAPITAL INVESTMENT PER HECTARE FOR 12 HECTARE HOP FARM

| | Per Hectare |
|---|---|
| Land and Dwellings with Trellises and Irrigation Equipment ($90,000) | 7,413 |
| Picker and Associated Shedding ($36,000) | 2,965 |
| Kiln, Fans, Blowers etc. ($24,000) | 1,977 |
| Vehicles and Farm Plant ($13,500) | 1,112 |
| Total | 13,467 |

A range of interest rates from 7% to 14% showed that return per kilogram of hops would need to be from 45.32 cents to 84.7 cents in order to give adequate return on capital, using the 2,223.9kg. yield divisor. Thus, for a 12 hectare farm, the cost of production plus return on capital would need to be 226.14 cents per kilogram, assuming a 10% interest rate. Prices for hops were well below this figure after the 1973-74 over-production, even on

the domestic Australian market, and although the price of hops sold in Australia has reached $2.70 to $2.86 per kg. in recent years costs of virtually all capital and material inputs have risen substantially since 1974. In addition, only 65% of current production in 1978 is guaranteed the domestic price, the remainder having to be sold on an uncertain export market for much lower prices.

The importance of yield to the individual farmer can be seen to be considerable, for average costs per kilogram are most affected by the actual yield per hectare. As well, growers are currently paid a slight premium for high-alpha hops and suffer a penalty for low-alpha hops.

The discussion of costs must bear in mind the considerable differences in managerial skill and in opportunities for marginal costs to be kept to a minimum for maximum increase in output. One hop farmer who runs a dairy utilizes manure from the dairy for his hops and another has taken opportunities to purchase fertilizer, string and used hop poles at bargain prices in order to reduce input costs. Referring to the productive function diagram (Figure I.3), it can be seen that if the reduction in average product (yield) is less than the gain in reduced labour costs by reducing this input, overall relative increases in average product (AP) may be achieved. This is precisely what the very large operators are currently doing by eliminating expensive cultivation and dressing of their fields. Smaller growers have also eliminated dressing with the Pride of Ringwood hop because yields are apparently not seriously affected (see field comparisons in Plate IV.2), but one grower informed the

Plate IV.2a
Cultivated and "dressed" hop field.

With permission,
Tasmanian Department of Agriculture

Plate IV.2b
"No cultivation" hop field.

With permission, Tasmanian Dept. of Agriculture

writer that he was still dressing his 14 hectares of hops because it was profitable to do so. This particular grower was noted for his high yields and excellent alpha acid content of his cured hops, and yet a number of nearby farms in the Lachlan and Molesworth region obtain alpha acid values that are lower than the desirable level of 10%. It is quite possible that diseconomies of scale are affecting the larger growers, and that smaller growers can achieve relative gains by intensifying their own cost-free labour inputs. This is particularly the case if the smaller grower owns his land, buildings and machinery and does not have to either pay interest on them or consider a return for shareholders' investment. Several such smaller farmers have survived the recent period for this reason. Since 1973-74 the consumer price index in Tasmania has risen by about 47% (A.B.S., 1977b) but it is not practicable to use this criterion to assess price increases for hops in the period for several reasons. Structural change within the industry has continued to favour an increase in average farm size so that by 1978 the mean size of effective producing area is about 25 hectares; only six growers have less than 15 hectares. Two of these have associated dairying interests, one is a family partnership having outside income and is not seriously affected by the need to ensure adequate returns to capital, and one is virtually a hobby farm aiming at the home-brewery market. Of the remaining two, one has no harvesting machinery and is intensifying labour inputs on existing ground to try to maximize yield, and the other will need good crop years and high prices in order to recoup losses of the past few years.

It was suggested to the writer by a large grower in the north-east of the state that the cost spiral of the last few years has actually helped the industry in that those who remain in production will eventually have the market to themselves as initial establishment costs are now so high that new growers can not be expected to enter the industry (Davey, 1977). However, assuming that total domestic demand in Australia eventually will rise above the level of supply, price inelasticity of demand will ensure a level of profitability for producers that is again attractive for new growers to enter the industry, repeating the familiar pattern of expansion of the extensive margin of production. Current indications are, however, that this will be a long time in eventuating.

It is quite clear that the future demand for the crop on the export market is uncertain and unless long-term export contracts can be obtained it will remain uncertain. The production capacity of the industry within Australia still exceeds domestic demand so that the domestic price is not likely to rise dramatically in the short term. A study in late 1977 showed that establishment costs for new hop grounds range between $4,900 and $6,200 per hectare excluding the cost of the land (Ross, 1977). Operating costs including harvesting are probably double the McColl (1974) range of from $1,621 to $1,674 per hectare per yield of 2,224kg., and assuming land costs of only $1,000 per hectare and return to capital at 10% the required capital return ranges from $590 to $720 per hectare. Assuming a 100% sale at a domestic price of $2.86 per kilogram which is not probable under the present conditions, the maximum net profit to the grower

before his labour costs are computed would be about $2,500 per hectare. If domestic sales were only 65% of the crop and export sales were at $1.40 per kilogram the profit per hectare would be $1,392 at most and as little as $1,202 at the higher end of the cost range.

It should be pointed out in any discussion of the economic structure of the hop industry in Tasmania that the existence of the large factor, H. Jones and Co. as a grower of hops enabled the industry to adapt readily to competition from Victoria. The success of the Carlton and United Brewery's hop research station at Ringwood, established in 1950, was such that the Victorian industry may well have gained a virtual monopoly on hop production in Australia had it not been for H. Jones and Co. This company established Tasmania's hop research station at Bushy Park in 1961. Although the research here was funded by a levy on hops, Jones and Co. expended considerable money of its own to assist other growers. With the Ringwood Special and Pride of Ringwood varieties, Jones and Co. took plantings to a property at Triabunna and developed hop sets for all growers in the state at nominal cost to the growers (Loney, 1977).

Another structural element relating to the Jones and Co. interests is that from the earlier decades of the century this company purchased and operated hop grounds in a number of localities including Margate, Ellendale, Lachlan, Westerway and Plenty. Only as properties in the Bushy Park - Macquarie Plains area became available for purchase or lease did the company gain an interest in the core region, and its complete domination of the core region is a relatively recent phenomenon. The hop

production on the farms in the peripheral regions has gradually ceased as the company has built up its holdings in the core region. There are in fact five Jones and Co. properties within the core, but they are operated as six separate units and have been recorded separately in the analyses of structural and locational change. The current holdings of Jones and Co. in the core area are approximately 178 hectares.

Hop factoring and marketing

Currently the majority of hops produced in Tasmania are sold through the Australian Hop Marketers, a subsidiary of the leading hop factor of the period before 1975. The A.H.M. is, however, not a hop factor but simply a buying and selling agency aimed at ensuring maximum stability within the industry. It has six grower representatives on its board, and endeavours to obtain domestic sales for the highest possible proportion of the hops it handles. Remaining hops are sold on the export market at lower prices than the domestic price, and returns to growers are proportionate to the balance of domestic and export sales (Longbottom, 1977). New growers are not allowed to sell through A.H.M. unless they have purchased existing hop grounds, but there are independent hop factors in Victoria who will contract to purchase hops from Tasmanian growers, and thus the possibility of further plantings still exists. However, it seems from interviews with present growers that the current system is the best that has existed in the industry for some years; growers know in advance that a certain proportion of their hops will have domestic sales whereas in earlier years of overproduction some growers were simply excluded from the market entirely. The absence of govern-

ment involvement, either state or federal, in the marketing of hops from Tasmania relates to Section 92 of the Commonwealth Constitution which excludes from compulsory domestic marketing arrangements produce going into interstate trade (Harris, 1974; Williams, 1967).

Hop factoring, which involves services to growers such as supply of merchandise, advice on farming techniques and purchase of hops, undoubtedly played an important part in the localization of planted area in southern Tasmania throughout the first century or so of commercial production of hops in the state. As Harvey (1963) demonstrated in relation to hop production in Kent in the nineteenth century, finance was more readily obtainable from hop factors with a knowledge of hop growing areas than from sources outside the established areas. This fact alone tended to perpetuate and concentrate production in known areas. Pearce (1976) has commented a number of times on the stabilizing influence of the hop factors in the Tasmanian industry and mentions particularly the period from 1935 to 1940 when there were five factors operating in the state.

In 1945 H. Jones and Co. were responsible for the sale of hops from 340 of the 448 hectares of hops in the state, representing 38 of the 69 growers (Pearce, 1976). A grower's contract for 1940 to 1943 hop season illustrates the rigid control exerted by this hop factor over increased acreage (Geard, 1939). The grower in question had four hectares of hops in the Lachlan area and his approximate annual production of "English varieties" was 10,900 kilograms. The price to be paid was 31.17 cents per

kilogram (1s.5d. per 1b.) dried, with complete refund for hops found to be sweated or in poor condition. No price inflator was included, and the company could exercise an option for a further two years under the same conditions by July, 1943. Fortunately, inflation was not a serious problem during the war, and the price was quite good in terms of the expected yield and costs of materials and labour. However, any excess over the 10,900 kilograms would involve a 50% price reduction. Further, the contract expressly forbade any increase in planted area without the factor's written consent (Geard, 1939). It can therefore be seen that the factor was actually able to keep effectively the expansion of planted area below the level of Australian domestic demand, thereby ensuring that prices would remain buoyant for producers. The factor gained in higher commissions, but also from good prices for hops grown on his own land.

Factors usually were able to assist growers by obtaining materials such as fertilizers, coir yarn or string, machinery and utensils at wholesale prices. However, the price reductions were not always passed on to growers, but growers commonly had to use the credit facilities offered by factors against the returns from the next year's crop. In some cases, mortgage finance or finance for establishment or expansion of hop grounds, or purchase of harvesting machines was lent through factors; factors were thus able to foreclose on inefficient producers. In 1969, peak seasonal debt from factor finance in Victoria and Tasmania approached $1.7 million. The gross value of the 1969 crop was $3,978,000 and the "hard core element" in the factor debt was estimated at $560,000 (Makeham, 1970). Factor interest rates were usually at or above bank interest rates, so it is clear that

growers depended upon this service to a considerable extent and that the factor was a necessary part of the structural arrangement of the industry.

From 1936, when the first community kiln was erected at Bushy Park (Pearce, 1976) the factors have also provided a service which has had particular spatial impact. Prior to this time, most growers either had their own kilns or used a neighbour's kiln to dry their hops. Unskilled operatives and poor equipment usually meant that up to 30% of hops dried were of inferior quality when brought to the factors. By selling their hops green at the community kilns, growers were relieved of the worry of drying their hops, and general improvement in quality resulted. Growers who may have wished to produce hops in outlying districts were at a disadvantage however, for transporting green hops is several times more expensive than transporting dried hops. More importantly, green hops are damaged if transported long distances; cones are bruised and broken and the essential lupulin glands are fractured, with a resulting rapid deterioration in alpha acid content. Thus only if there were significant numbers of growers in a locality would it pay the factor to build a community kiln, and this explains the location of these kilns at Ellendale, Westerway, Bushy Park, Plenty and Lachlan. A kiln at Margate also dried hops for two growers from Kingston, but this kiln was mainly for the large Jones and Co. holding at Margate and not really a community kiln (Geard, 1977).

In the case of the emergence of the new production in the Scottsdale region, the services of the hop factor were not required as growers here had access to independent sources of

finance and were capable of developing the expertise to dry their own hops in new, modern, locally-developed kilns. Not only did the Scottsdale producers develop the most efficient drying system in Australia, with revolving drying floors and high pressure forced air furnaces, (Longbottom, 1978) but they also developed the first pelletizing plant and vacuum-sealing system for hops in Australia. Innovation of this sort is clearly a substitute for the hop factor's services, but growers in the south of the state were apparently unable to achieve the same independence from the factors.

The point was made earlier that the factors also maintained a management role for many smaller growers. An itinerant farm 'manager' visited many of these growers as often as once a week and instructed them on details of planting and crop management (Ross, 1977). In effect, the smaller grower was often little more than a labourer who shared in the profits from his crop or suffered the losses; he could hardly be termed an independent *Homo economicus*. Again, it would suit the factor not to have to provide such services at great distances from the core production area. More importantly however, it meant that the smaller grower did not have to worry about internal decision-making; nor therefore did he have to have any knowledge of the external economic conditions likely to affect his livelihood. Undoubtedly it would have come as a great shock to many smaller producers to find that they could not sell their hops after 1973-74, whereas a knowledgeable producer could have foreseen the situation from as early as 1969, or even earlier. The Makeham Report (1970) was particularly critical of the failure of the hop

factors to communicate to both growers and brewers the nature of the facts on hop production. They stated in fact:

> "in an industry as small as the Australian hop industry the middle man is always at risk that the producers and consumer will meet and find that the middle man is unnecessary. It would appear that the factors have endeavoured to defend their position by ensuring that they were the only persons in the industry who really knew what was going on" (Makeham, 1970, 22).

Prior to 1969 the factors had apparently made no attempt to anticipate the market demand, and even by 1969 when it was clear that brewers were demanding more Pride of Ringwood hops, plantings to this variety on factor-owned hop grounds were only 28% compared with an industry average of 32% in Australia (Makeham, 1970). The lead was not given in the south of the state by the hop factors in Tasmania, but the Scottsdale producers were the first to change completely to Pride of Ringwood (A.B.S., 1974) and were in a better position at the critical time of over-supply of the domestic market to supply the variety of hops required by the brewers. The further point is made by Makeham that while demand and supply trends should have been clear to factors in 1970, some factors were restricting production and enforcing quotas amongst growers while others were actively sponsoring new plantings and expansion of the industry.

It is worth noting that active members of the Hop Producers' Association have been much better informed on the total production, pricing and marketing of hops than have the hop factors. Submissions th the Tariff Board inquiry in 1943 reveal research which examined the overseas supply and price situation

in both Europe and North America (Hop Producers' Association, 1945). An undated submission by this body to the federal government in about 1969 requested government action to freeze the existing acreage, and detailed the problems arising from the cost-plus pricing system which unfairly penalized growers in years of oversupply. It also detailed a scheme whereby a fraction of the amount of excise earned from beer consumption (over $2,500 million in the previous decade) could be used to stabilize the industry. Briefly, this involved proportional allocation of excess production of hops to the brewers, the cost to be deducted from excise duty payable. Hop merchants would endeavour to export the surplus, but presumably if they could not find markets the growers would still be paid for all hops produced - at the taxpayers' expense.

The present scheme for marketing of hops is essentially unchanged over that in 1970 except that all growers have equal proportionate access to the domestic market under the Australian Hop Marketers. As pointed out by Harris (1974), when an equalization scheme involves a domestic price which is higher than the export price, the incentive exists for some growers to sell interstate outside the scheme at the higher home price and hence to undermine the equalization arrangements. This is exactly the situation with one larger grower in the Derwent Valley in 1978 who has signed a five-year contract at full domestic price with a Victorian grower. In another case, a smaller grower in the Derwent Valley is not a member of the A.H.M. but is hoping to sell his hops directly to a brewer. This type of arrangement suits the brewer who is afraid of the bargaining power of organized grower

associations; for the small producer a 100% domestic sale for his hops ensures survival of his otherwise unviable operation.

In 1976, a detailed proposal from a leading hop producer to the Tasmanian and Victorian hop producers' associations outlined the then-current market situation and proposed a major restructuring of the industry and its marketing organization. It proposed that in view of the uncertain export market the federal government should institute a vine-pull scheme whereby a grower would agree not to grow hops for five years and would receive a grant of $2,471 per hectare ($1,000 per acre) in compensation. Larger growers would receive this money in the form of a loan as they would not qualify for rural reconstruction (Shoobridge, 1976). The proposal suggested a desirable reduction of 600 hectares which would reduce total production to well below the current level of Australian demand, and presumably return the surviving growers to a position of profitability. The proposal also detailed a restructured marketing arrangement which would substantially reduce the role of the hop agents and by a system of contracts similar to that operating for tobacco growers ensure that over-production did not arise again. However, the proposal was not taken up by the industry, and the forced reduction of grower numbers has continued to 1978.

The current domestic price for Tasmanian hops is about $2.86 per kilogram and the export price has varied within the last year from about $1.40 to over $2.00. However, drought in Europe in the summer of 1976 reduced hop yields, and hop producing regions in the United States suffered similarly, creating temporary world shortages, but it is not widely expected that these

shortages will persist. One indication of likely trends to come in the Tasmanian industry is the fact that alpha acid yields of up to 16% are currently being obtained from new varieties of hops in the U.S.A., and it can be expected that these varieties will be demanded by Australian brewers. There are also experimental plant breeding programs at 'Roslyn' research station (Bushy Park) and at Ringwood in Victoria which continue to endeavour to increase alpha acid yields.

Interestingly, at the time of writing, the hop fields of Kent are being seriously threatened by a new form of disease, progressive verticilium wilt (London Daily Telegraph, July 20, 1978). Damage is apparently severe and it is quite possible that a stimulus to further exports from Tasmania will result.

Farmer response to change - behavioural considerations

To this point in the analysis of the hop industry in Tasmania it has been assumed that the industry is peopled by rational decision-makers in possession of sufficient of the facts that spatial adjustment can be explained by known changes in the variables affecting costs of production and returns to growers. Changes in costs of factor inputs and/or returns to farmers over time have led to adjustments in farm numbers and planted area which have successively demonstrated the considerable variation in the capacity of regions to survive as hop producing localities during periods of general decline within the industry.

However, it remains to be shown that in combination with the rational decision-making of the type described to this point there are considerations of a behavioural type that have also had

a bearing on the spatial changes, and in particular on the major regional shift that has occurred with the development of the industry in the north-east of the state in the last two decades. AS Harvey (1966, 373) state:

> "if we recognize the all important fact that geographical patterns are the result of human decisions, then it clearly follows that any theoretical model developed to 'explain' agricultural location patterns must take account of psychological and sociological realities, and this can only be accomplished if the normative theories of agricultural location are made more flexible and blended with the insights provided by models of behaviour".

Yeates (1968) details the Hagerstrand simulation models for the diffusion of technical innovations among farmers, but as Harvey (1966) points out there is no reason why a particular type of cropping system could not be subjected to a similar application of the model. Monte Carlo methods, as used by Hagerstrand, undoubtedly could produce results similar to the spread effect which occurred after initial trials had demonstrated that hop production was feasible and profitable for farmers in the north-east of the state. As in the Hagerstrand case studies, not all farmers in the north-east adopted the crop, probably for a wide variety of reasons. However, hop production was taken up by more than 19 farmers, some in localities up to 45 kilometers from the initial holdings. It is interesting to note that all farmers who did adopt the crop were within close contact with the initial adopters by road as all the farms lie within close proximity to the Tasman Highway (ref. Map III.1); suitable areas for hop production undoubtedly lie in the Fingal Valley and upper South Esk

Valley which are equally close to the initial innovators in the north-east but are not connected to the Tasman Highway, and are distant in terms of personal contact-time and effort. In fact, both the Fingal and upper South Esk Valleys produced hops in the late nineteenth century as did other localities in Tasmania which have not done so since.

Interviews with hop growers in the north-east indicate also that a very conscious searching process was undertaken by the initial protagonists of hop production in the region in order to find a crop suited to the locality and capable of generating good returns. While no other crops were actually pioneered in the locality by these initial growers, the experimental plots of hops were very much more than merely random chance efforts. Hop growing was studied through an extensive overseas trip by one of the dairy farmers and both of the initial hop producers spent some time travelling within Tasmania and Victoria to examine the industry. Other crop enterprises considered but rejected included grapes for wine production and various nut-tree enterprises (Davey, 1977). The search process was aided by the Tasmanian Department of Agriculture, and such is the feeling among some former hop growers interviewed in the south of the state that they suggested to the writer that the move to introduce hops in the north-east of the state was a political move inspired by those in the government who wished to break the power and influence of the leading hop factor in the south. This of course is highly unlikely, given the relatively prosperous state of the industry in the late 1950's. However, southern growers are well aware of the extent of searching and learning that was involved in the establishment of hops in the Scottsdale area. The two initial growers had no

experience with hops but were willing to learn and capable of doing so. Both were ex-army civil engineers who had had post-war experience in dairy farming and who could readily undertake the task of building and adapting modern kilns and a central pelletizing plant. In fact, a grain pelletizer, normally used for preparing animal fodder, was adapted for hops, and coupled with a packaging system employing nitrogen-flushing to expel oxygen from plastic bags, thereby reducing oxidation and loss of alpha acids. There was therefore considerable energy and enthusiasm exerted on the part of the two initial growers in the region, and this enthusiasm was contagious; some 19 farmers in all commenced production of the crop. Although there were small producers in the region the economies of scale deriving from increased inputs of land, capital and technology were quite well understood by those growers who persevered through the difficult period around 1973 - 1975, and who remain in production in 1978; there are 11 such growers, including one of the initial growers in the region who in 1978 is the largest private grower in Australia.

The searching process that preceded the introduction of hops in the Scottsdale area was a search for a suitable crop; the searching process that characterised the initial establishment period in the Derwent Valley involved a search for a suitable environment, but both periods have much in common. Diffusion of information and advice from leading individuals was common; both periods winessed the emergence of a dominant or core area of production; and relatively soon after the commencement of production in both localities there was a contraction of production in outlying areas which may be regarded as the extensive margins of production. In addition, both periods were periods of technical

innovation; leading growers being also the leading innovators; irrigation technology and suitable hop kilns or oasts characterised the Derwent region's early establishment period while further improvements in drying and a completely new approach to packaging of hops were characteristic of the early phase in the north-east.

There was, however, a number of other important behavioural differnces between the growers in the north-east and those in the south of the state. Whereas in the south some growers have always used other growers' kilns for drying and at least one group of smaller growers actually discussed collective purchase of a harvesting machine, there has never existed here a spirit of deliberate co-operation and collective sharing of skills and resources to match that which exists in the north-east. There, right from the start, a growers' association and marketing body was formed, but it actually functioned as an active co-operative association, playing a direct role in on-farm decision making and processing of the region's hops. In addition, growers reduced their initial factor inputs by building only one large kiln for two or three growers and buying one harvesting machine between several growers. Such was the enthusiasm and co-operation of the region that one large grower from the Derwent Valley actually joined forces with the north-east, marketing his hops through their association. Here, incidentally, there was no need for a hop factor, and the flow of information on markets, sales and production was excellent.

Only when the over-supply situation of 1973-74 and subsequent years occurred did these growers join forces with the remaining hop growers in the south to form the Australian Hop Marketers.

In contrast to the north-east's approach to production is the poor information flow which prevailed for many years in the south.

Of 16 former growers who responded to the questionnaire item on sources of information (ref. Appendix III) 12 indicated that their most frequent source of information on hop production was the hop factor, three indicated 'other hop growers' and one indicated that it was the Department of Agriculture. Interviews of growers in 1977 indicated that the reliance on the hop factor had been considerable until 1973-74, but that since that time they had had better communication with each other through the Australian Hop Marketers; the latter organization is a subsidiary of the leading hop factor, H.Jones and Co.

Several former growers indicated that they discussed hops with neighbours but that such discussions were quite often only in the hotel by way of 'bragging' about yields. Naturally, some inflation of true yields was involved and may well have flowed into official statistics. As an instance of the lack of communication in the Derwent Valley as recently as 1977, the writer talked with one grower in his hop ground about marketing and while receiving instructions on how to select the lighter vines to tie up to the twine was told that there were no other growers apart from one hobby farmer growing hops in the area. Also, the point was made that the big threat to orderly marketing within the industry was those growers who would not sell their hops through the A.H.M. Apparently, the tying up of the heavier vines produces plenty of growth but lower yields from the hop bine. Less than 1.5 kilometres away from this grower, the writer found another hop grower also tying up his vines; he was selecting the heavy vines to tie up, and was in fact intending to sell his hops outside the A.H.M. The incredible point is that the first grower knew nothing of the second grower's hop production nor of his marketing intentions, yet here was an ideal opportunity for co-operation between growers, for the first grower had a harvester and kiln with spare capacity and the second grower lacked both, intending to hand pick or lease a machine elsewhere and to cart

his green hops to an old kiln which he 'hoped he could get to do the trick'.

Since the oversupply situation of recent years has developed, although many growers have been reluctant to reduce planted area, several indicated that they have reduced some inputs of labour. Less care is being taken of individual plants on some of the large hopgrounds particularly, and in the very windy growing season of 1978 when hops were being blown from their strings in large numbers relatively little labour was being expended to make good the damage; this may be regarded as a rational decision to maximize the difference between total costs and revenues, but at least one large grower indicated his awareness of the current over-supply situation when giving reasons for this decision to reduce labour inputs.

A similar point applies to the widespread cessation of annual pruning of each hop plant since labour costs have risen in recent years. A widely held view in the industry is that pruning is more costly than the increase in yield resulting from it warrants, but at least one former grower had found that the improved yield warranted the extra cost.

It is evident from the detailed interviews of present and former growers in both parts of the state that the response to changing economic conditions and new technology differed between the two parts of the state. With few exceptions in the south, farmers seemed to want to find a scapegoat for their problems, whereas there was a spirit of cautious optimism in the north-east. Many of the former growers in the south with whom the writer spoke were particularly bitter about the Scottsdale producers entering the industry in the first place, but their own knowledge of what had happened in terms of oversupply was

apparently of very recent origin, and the Scottsdale area had been producing considerable quantities of hops since the mid-1960's. The southern growers had simply failed to restructure their production in time to survive the inevitable over-supply situation. It could simply be argued that if the north-east had not begun production when it did, Victorian producers would have seized the opportunity and expanded even more than they have in the last two decades. Similarly, had the southern growers seized the nettle in the 1960's and co-operated to buy harvesters and build modern kilns, acreages could have been merged for efficient operation and smaller growers could have left the industry with the value of their hopgrounds to their credit. Many of the smaller hopgrounds in the south were adjacent or contiguous, but rather than rationalize in this way most of these growers have lost their entire capital investment. Medium to larger growers could have remained competitive and indeed have had relative advantages over growers in the north-east who had much higher capital per hectare to expend in order to establish new hopgrounds. Such adjustment in the south would have prevented, or reduced the opportunities for new plantings on the scale that occurred in the north-east. This view has been confirmed from discussions with growers in 1977 and 1978 in both parts of the state.

A point of some concern pertinent to the future survival of southern hop producers is that many of the soils of the core area have grown hops for over 100 years and are showing signs of serious depletion. The effects on yield may well become intolerable within the next decade or so, and the north-east can be expected to gain relatively as a result. If the H.Jones and Co. holdings were to cease hop production the southern growers would lack an adequate marketing organization and may well not survive. Producers in the north-east have no such long-term worries and have already demonstrated that they can produce over half of the state's total output (A.B.S., 1976b).

Harvey (1966), Wolpert (1964) and Chorley et.al.(1967) have argued that the normative economic theory of classical economics is untenable because of the multiple of variables and uncertainties which reduce the capacities of decision makers to act as rational maximizers, but the majority of hop producers have been seen to have had few other farming interests or activities. Choices are limited because of the perennial nature of the crop and the very high establishment costs so that, in effect, a farmer who plants hops is stuck with them throughout the good and the bad times until he pulls them out of the ground. There is no annual decision as to which crop to grow, and only a long-term risk of returns falling below costs for it is known that for three years after planting costs will far exceed returns. Farmers have generally been forced to maximize yields because on this result largely depends the profitability of the enterprise. Where consistent decisions of a non-maximizing nature have been made, normal seasonal fluctuations in yield have generally ensured the failure of such an enterprise; if for some reason quality has not been satisfactory the factor has normally refused to buy or has purchased the hops at a reduced rate.

# C H A P T E R V

## CONCLUSION

### Introduction

The study has endeavoured to isolate major influences contributing to the spatial arrangement of hop production in Tasmania. Economic, environmental and socio-political factors have been analysed in historical and contemporary context within the confines of normative economic considerations which have been shown to be significant in the validation of the explanation. The major recurring problem has been a deficiency of certain of the data - particularly those relating to past environmental constraints and those involving behavioural reponses of hop growers. The attempt has been made however, to demonstrate the interaction of certain behavioural characteristics of farmers with the over-riding physical and economic considerations.

The remainder of the concluding chapter will attempt to summarise the extent to which the normative and behavioural approaches have enabled an adequate explanation of the spatial arrangement of the industry, together with specific commentary concerning the individual themes proposed in Chapter I. The final section will briefly consider the future of the hop industry in Tasmania and make appropriate recommendations on the need for more adequate data in order to facilitate scientific explanation of the spatial distribution of the industry.

### The normative and behavioural frameworks

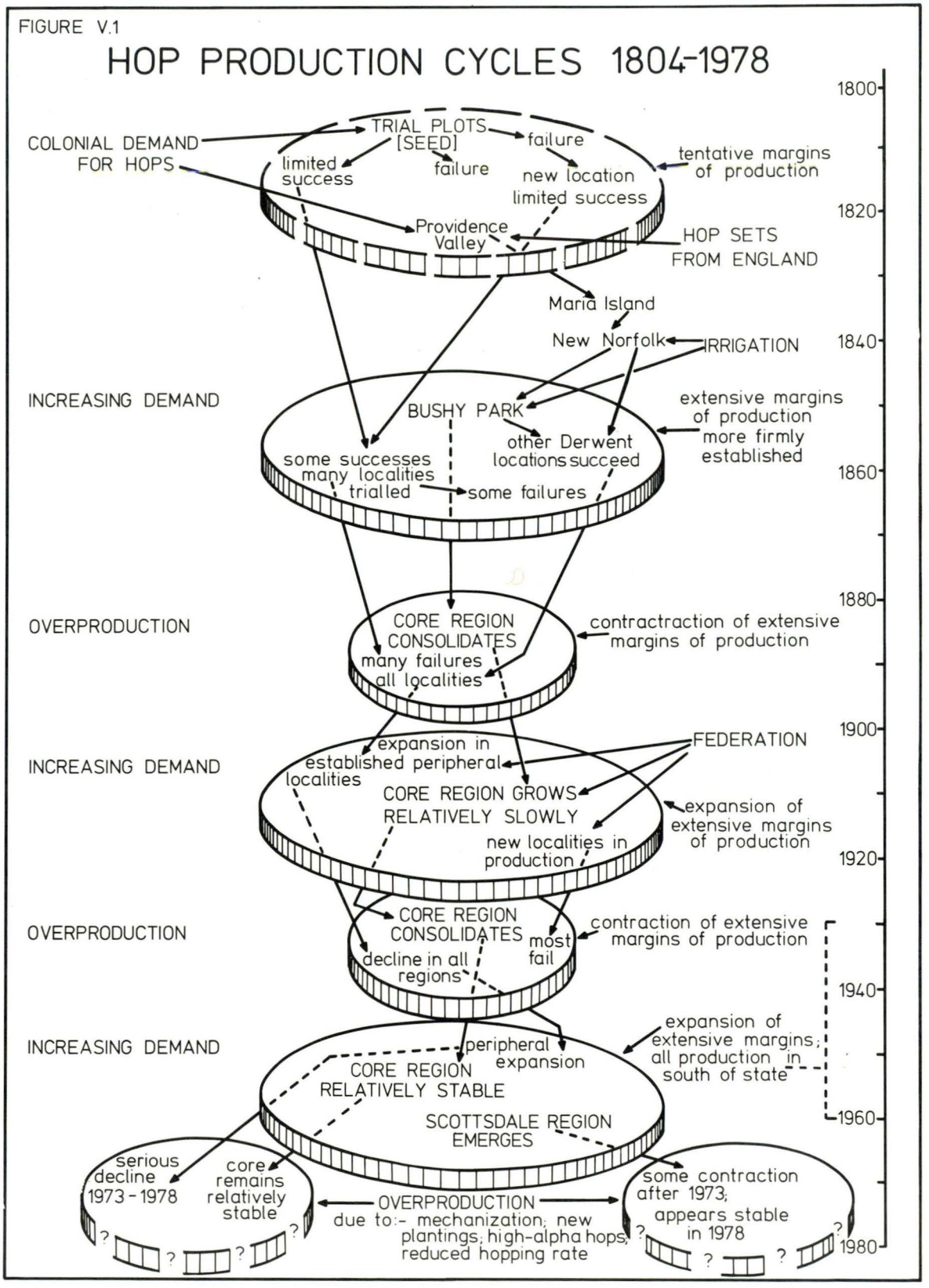
Aspects of normative economics applicable to the Tasmanian hop industry were described in Chapter I. In particular, the price inelasticity of demand characteristics have acted

as the major price influence, and cyclical responses in terms of area planted to hops have been typical of the 175-year history of the industry. These cycles, however, have generally been long-term fluctuations and not short-term price-triggered responses of the kind envisaged for example in the cobweb theorem (see Heady, 1952); factors quite external to the hop industry itself have frequently caused relative changes in the equilibrium of supply and demand relationships.

In order to summarise the discussion of broadly similar periods of expansion and contraction of the extensive margins of production and incorporate important inputs affecting the spatial distribution of the industry, a simple explanatory model (Fig. V.1) has been developed. Major cyclical reversals have usually occurred over periods of several years; important events are therefore depicted in a 'time slice' sequence with the diameters of the segments representing the periods of alternate maximum and minimum extent of the extensive margins of production. No mathematical relationship to planted area is intended in the 'time slices' however as changes in grower numbers and losses of smaller holdings have always been far more significant during periods of decline within the industry than have changes in total planted area.

In the first 'time slice' segment of Figure V.1, the industry's tentative beginnings represent the process of searching and learning about a new environment; trial and error undoubtedly was necessary before real commercial success was achieved - by the mid-1850's or so. The impact of specific events such as the introduction of irrigation in 1840 (Cyclopaedia of Tas., Vol. I) or the abolition of Victoria's tariff on imported hops when

FIGURE V.1


HOP PRODUCTION CYCLES 1804-1978
1800
1820
1840
1860
1880
1900
1920
1940
1960
1980
COLONIAL DEMAND FOR HOPS
TRIAL PLOTS [SEED]
failure
limited success
failure
new location
limited success
tentative margins of production
Providence Valley
HOP SETS FROM ENGLAND
Maria Island
New Norfolk
IRRIGATION
INCREASING DEMAND
BUSHY PARK
other Derwent locations succeed
extensive margins of production more firmly established
some successes many localities trialled
some failures
OVERPRODUCTION
CORE REGION CONSOLIDATES
many failures all localities
contractraction of extensive margins of production
INCREASING DEMAND
expansion in established peripheral localities
FEDERATION
CORE REGION GROWS RELATIVELY SLOWLY
new localities in production
expansion of extensive margins of production
OVERPRODUCTION
CORE REGION CONSOLIDATES
most fail
decline in all regions
contraction of extensive margins of production
INCREASING DEMAND
peripheral expansion
CORE REGION RELATIVELY STABLE
SCOTTSDALE REGION EMERGES
expansion of extensive margins; all production in south of state
serious decline 1973 - 1978
core remains relatively stable
OVERPRODUCTION due to:- mechanization; new plantings; high-alpha hops; reduced hopping rate
some contraction after 1973; appears stable in 1978
?

Federation occurred in 1901 (Cyclopaedia of Tas., Vol. II), can be seen to have provided expansionary stimulus to the industry. Ironically, such external stimuli led to periods of marked over-production and subsequent contraction of the extensive margins of production, notably in the mid-1880's, the early 1930's and the early 1970's. The latest collapse and contraction of the extensive margins of production has seen the survival of a relatively new and large-scale production locality in the north-east of the state; the long-established core production region in the Derwent Valley is now seriously challenged for this position, and the 'time slice' segment in the model has been appropriately sub-divided to represent the two quite separate localities.

Within the constraints of the limited market for the commodity, two prime variables have been of greatest concern to growers; the yield of their crop and the price they received for it. While the yield has been seen to be partly affected by farming practices, major seasonal fluctuations have always been beyond the immediate control of farmers. Price, however, has been directly an outcome of the quantity of hops produced - the relatively brief 25-year period from 1945 excepted. Growers and factors have had some capacity to increase prices when demand was high, but this capacity has been less than might otherwise have been expected due to the brewers' ability to stockpile and to export. In years when supply has exceeded demand, the grower has been virtually entirely at the mercy of the brewer; internal marketing arrangements favouring larger growers and factor-growers have at such times ensured the demise of the small grower.

Prior to 1960, internal fixed factor costs favoured the small producer for whom inputs of his own labour constituted

a substantial proportion of total inputs. Subsequently, reduced unit costs of production made possible by mechanized harvesting and other technological advances have led to a substantial increase in average farm size in order to maximize scale economies. The increased capital inputs as a substitute for expensive labour have resulted in marked shifts to the right in the average and marginal product curves in Figure I.3, with consequent shifts in the 'feasible zone of production'. Since 1968 when a post-war peak in grower numbers occurred, the decline in grower numbers has been in the order of 80% while planted area has remained relatively constant.

Probably the most remarkable feature of the collapse of the industry since 1973-74 has been the survival of the relatively newly established hop production in the north-east of the state at the expense of long-established growers in peripheral localities in the Derwent Valley. This regional relocation of the industry has been seen to be at least partly a function of behavioural differences between growers in different parts of the state; the south has tended to be traditional and slow to adjust to the new economic realities. The north-east had the advantage in terms of a later establishment when economies of scale could be realized from the commencement of the enterprise, but it has furthered its lead over the south of the state through recognizing the value of co-operation in such matters as the sharing of major capital inputs. Much of the success of the north-east is attributable to behavioural characteristics of the initial growers in the region; characteristics of energy and enthusiasm as well as co-operation perhaps not found in the south of the state since the initial pioneers in the region similarly demonstrated the advantages and techniques of hop

production to fellow pioneers in the 1860's (Cyclopaedia of Tasmania, Vol. I).

The lack of available data of a behavioural kind pertinent to the earlier periods of the industry makes valid comparison with earlier periods difficult. Similarly, shortcomings in the available published statistics are to be regretted. Nevertheless, the normative approach has to a large extent served as a valid theoretical framework for the analysis of an industry having such specific locational and economic constraints as has the Tasmanian hop industry. Behavioural considerations have been employed where possible to attempt to overcome some of the deficiencies of the normative approach.

Support for the major themes

The three major themes detailed in Chapter I have been seen to have general support from the available evidence. Certain specific relationships such as that between minimum temperatures in the growing season and crop yield have been tested statistically. Ideally however, multiple correlation of many more variables is needed before accurate conclusions pertaining to such considerations as the physical superiority of one region over another can be verified. For this reason it is considered to be appropriate to use the term 'themes' rather than 'hypotheses' to describe the specific concerns of the study.

The first theme concerned the relationship between hop prices and areal expansion or contraction of hop production. It has been seen that the cause of major periods of contraction within the industry can be traced specifically to over-supply

and declines in prices for the commodity. From the individual growers' point of view often income has been reduced to zero because of the peculiar marketing arrangements within the industry and the control of this aspect in the hands of companies who also happen to be hop growers and who naturally have sold their own hops, perhaps at reduced market prices, leaving some growers with no market. Undoubtedly, the attraction for growers to enter the industry when prices have been stable and markets assured has been financial reward; hop growing is costly, and is difficult, demanding toil, and could certainly have little appeal other than the attraction of possible large rewards. The relationship between price and marginal expansion or contraction in the spatial sense is therefore indisputable.

The second theme concerns the micro-regional variations in physical environment which explain the survival of hop production in certain well-defined localities; notably the Bushy Park - Glenora core region, and more recently the Scottsdale region, during periods of price decline. Again, data on the local micro-climates are deficient, but several important micro-regional differences have been clearly identified and certain statistical evidence of their importance has been presented. Soils have been seen to be less important than often thought as a localizing variable in Tasmania, and micro-climates are thought to be of sufficient importance to warrant further investigation. Some significance has been seen to attach to the question of distance from the core area, supporting findings of Harvey (1963) in the case of the industry in Kent, at least until 1960 when changed technology allowed the entry of new growers in the north-east. That there is considerable micro-regional diversity in the Tasmanian hop industry has been clearly estab-

lished, particularly in relation to average hopground sizes, farm structure and farmer behaviour. The total contribution of each micro-regional variable to the long-term survival of individual enterprises is beyond the possible scope of this study. Nevertheless, that distinct differences in response to prevailing conditions have operated at the micro-regional level is evidenced throughout the study and is probably best illustrated by comparisons over time of the detailed maps of hopgrounds in the different micro-regions. These extracts from aerial photographs, when compared with the histograms indicating size-distribution of hopgrounds per farm, provide visual evidence of the advantages of economies of scale relative to micro-regional variations in average hopground size. Undoubtedly, part of the variation between micro-regions in response to prevailing economic conditions derived simply from this initial size variation, but taken together with physical and structural differences between the regions it is clear that the theme has substantial support.

The third theme is virtually self-supporting once the size-relationship and capital intensity of existing farms in Tasmania in 1978 are analysed. The small farm operated by one family who provide most of the labour is now atypical. Most owners of smaller hopgrounds work in full-time employment off-farm in order to keep the enterprise going, or have diversified enterprises with major proportions of farm income derived from the non-hop sector. The general statement that surviving farms in 1978 are much larger and structurally quite different from farms prior to the 1960's has been proven correct.

The future of hop production in Tasmania

That Tasmania will retain a viable hop industry into the foreseeable future is virtually certain; the size of the industry is more difficult to predict. According to previous experience, following the collapse of the early 1970's the industry should now begin to expand gradually, but there are several reasons for believing that this may not occur. The costs of establishing new hopgrounds have been shown to be somewhat prohibitive and current capacity of the industry is still above domestic demand. Any expansion in the immediate future would need therefore to be in response to export demand which has been seen to be relatively short-term and unreliable.

The relatively slow growth in beer consumption within Australia is probably insufficient to do more than offset increasing efficiency of hop utilization in the brewing process and generally declining hopping rates as lighter beers increase their share of the market. In other words, fewer hops will be required for the same quantity of beer. As well, brewers are free to import hop extracts,* currently used in relatively small quantities only (A.B.S., 1978). Domestic demand for hops is therefore unlikely to rise appreciably in the immediate future.

The possibility of further reduction in the area planted to hops appears to the writer to be far more real than the prospects for expansion. New hop varieties with alpha acids yields as high as 16% are reportedly grown in North America

* Hop extracts: concentrates of essential hop lupulin extracted by a very expensive process, mainly in Europe. Used only in small quantities to date in Australia. Should not be confused with synthetic hop extracts - chemical substitutes for hops- not currently known to be in use in Australian breweries.

(Ross, 1978) although the yield falls rapidly during drying; if this difficulty is overcome however, or similar advances made in other hop research areas such as the U.K. or Germany, the effect on planted area in Australia as a whole could be dramatic.

If future reductions of planted area occur in Tasmania, it seems again to the writer that the co-operative approach of farmers in the north-east of the state, together with apparent micro-climatic and other physical advantages of the region could well give sufficient advantages to producers in the region to force reductions to occur in the long-established core locality of Bushy Park - Glenora. The current uncertainty as to future developments within the industry, and their spatial impact, is indicated in the explanatory model (Figure V.1); the extensive margins of production as they existed in 1960 have contracted markedly since 1973-74 and the former core area is now rivalled by the new production locality and possible new core in the north-east; but the extent of the current period of decline is by no means certain as reflected by the discontinuous nature of the extensive margins of production indicated around both core localities in Figure V.1.

## Conclusions and recommendations

The study has attempted to explain the complexities of the spatial arrangement of the Tasmanian hop industry through examination of its historical development in relation to environmental influences, and through detailed examination of the contemporary industry at the level of the individual farm and the micro-region. Within the constraints and limitations of the available data a satisfactory level of comprehension of the industry has been attained; however there is much that could be

gained by way of more precise explanation given a more complete data base of both a climatic and industry-related nature.

General recommendations on the need for more detailed climatic investigations are likely to serve little purpose until the importance of the relationships between micro-climates and economic returns from individual farms and regions are more fully accepted at the official level. It is hoped however that this study has demonstrated the need for such intensification of the meteorological recording network.

Deficiencies in the past records of hop production are regrettably beyond retrieval but the Australian Bureau of Statistics has undertaken to re-examine the type of data collected from hop growers and the manner in which they will be recorded (Dealey, 1978). Ultimately, of course, there is no substitute for detailed field work undertaken according to the particular task involved, and much of the work in the present study is based on such field work. Invaluable sources of farm information often exist in non-official form and must be obtained for studies undertaken at the level of the individual farm; records of hop production on more than half of all hop farms in Tasmania over a 16-year period were intercepted by the writer as the former hop factor through which the farms sold their hops was about to dispose of its records.

Despite the shortcomings of the present study it has been argued that studies of an essentially idiographic nature such as the present one are a necessary first step in the ultimate formulation of deductive theories of agricultural land use. The general validity of the normative economic theory as

propounded by Found (1971), Heady (1952), Weller (1967) and others has had support from the various economic studies of the industry that have been commissioned in recent years (Shield at. al., 1966; Makeham, 1970; McColl, 1974). Studies of hop production in England undertaken by Harvey (1963) and Pocock, (1959) are clearly supported in terms of the spatial response of hop production to changing economic conditions by the present study of the Tasmanian hop industry. Hopefully, this study achieves both a desired methodology and appropriate outcomes commensurate with the inherent difficulties of the task and with the need for such micro-scale analyses of agricultural land-use.

Post-script

Since the major part of the work involved in this study was completed in 1978 it is interesting to note that the hop industry in Tasmania has again begun to expand, lending support to the general prediction within the thesis that there should be an expansionary phase after the collapse of the industry in the early 1970's and its gradual stabilization by about 1977. The size and location of the proposed expansion of the industry are both of considerable interest; in mid-1979 the H. Jones hop interests announced that they were expanding their hopground area at Bushy Park, although few details as to the extent of this expansion were given, but in January, 1980 there followed an announcement from the same company that it was establishing new hop production on some 400 hectares at Gunns Plains, south of Ulverstone on Tasmania's north-west coast. This expansion represents a 65% growth in the 1978 bearing area, and the fact that it is proposed for yet again a completely new production locality indicates considerable support for a number of the arguments pertaining to location developed within this study.

# APPENDIX I

## 1. GROUP MEAN SAMPLE FARM YIELDS IN KG. PER "HOP HECTARE" 1952 - 1966.

| Crop Year | Core Region | Westerway - Ellendale | New Norfolk - Lachlan - Molesworth |
|---|---|---|---|
| 1952 | 2,306 | 1,961 | 2,136 |
| 1953 | 2,412 | 2,155 | 2,259 |
| 1954 | 2,122 | 1,816 | 2,015 |
| 1955 | 2,461 | 2,546 | 2,393 |
| 1956 | 2,435 | 2,328 | 2,526 |
| 1957 | 1,907 | 1,769 | 1,884 |
| 1958 | 2,080 | 2,256 | 2,465 |
| 1959 | 2,732 | 2,150 | 2,396 |
| 1960 | 2,295 | 1,616 | 2,151 |
| 1961 | 2,436 | 2,532 | 2,492 |
| 1962 | 2,380 | 2,360 | 2,354 |
| 1963 | 2,104 | N/A | 2,454 |
| 1964 | 1,385 | 997 | 1,251 |
| 1965 | 2,658 | 2,275 | 2,073 |
| 1966 | 2,673 | 1,902 | 2,885 |

1950 - 1951 data for yields available but farm area not confirmed in all cases. Sample farm data are available to 1971 in many cases but after 1966 many holdings change planted area.

N/A - some sample farm data unavailable.

Source: H. Jones & Co. records.
Grower records (N.B.)

N.B. Where grower records were not consistent with factor records, the latter were used.

2. MEAN YIELD DATA SELECTED SAMPLE FARMS 1952 - 1968

| Crop Year | Yield in Kg. per "Hop Hectare" | | | | | |
|---|---|---|---|---|---|---|
| | Core Region Farms | | Westerway-Ellendale | | N.N. - L. - Molesworth | |
| | A | B | C | D | E | F |
| 1952 | 2,301 | 2,892 | 1,598 | 1,321 | 2,854 | 2,023 |
| 1953 | 1,548 | 2,086 | 2,773 | 2,873 | 2,028 | 2,096 |
| 1954 | 2,139 | 2,063 | 1,728 | 1,415 | 1,825 | 1,878 |
| 1955 | 2,611 | 2,440 | 3,340 | 2,998 | 2,123 | 2,642 |
| 1956 | 2,662 | 2,548 | 2,776 | 2,415 | 2,276 | 2,385 |
| 1957 | 2,099 | 1,655 | 1,724 | 816 | 1,540 | 1,928 |
| 1958 | 2,598 | 2,218 | 2,260 | 1,421 | 2,153 | 2,380 |
| 1959 | 2,315 | 1,855 | 2,751 | 3,482 | 2,043 | 2,324 |
| 1960 | 2,360 | 2,208 | 2,860 | 3,118 | 1,325 | 1,852 |
| 1961 | 2,650 | 2,359 | 3,020 | 3,416 | 2,328 | 2,624 |
| 1962 | 2,454 | 2,358 | 3,354 | 3,375 | 2,471 | 2,213 |
| 1963 | 2,448 | 2,325 | 2,796 | 2,210 | 2,123 | N/A |
| 1964 | 1,158 | 1,052 | 1,468 | 746 | 876 | 1,023 |
| 1965 | 2,542 | 1,950 | 2,696 | 2,354 | 2,270 | 2,043 |
| 1966 | 2,434 | 2,351 | 2,614 | 2,415 | 2,153 | 1,820 |
| 1967 | N/A | N/A | 2,743 | 2,513 | N/A | N/A |
| 1968 | N/A | N/A | 2,841 | 2,421 | N/A | 2,612 |

Source: H. Jones & Co. records.

3. BUSHY PARK MEAN TEMPERATURE $^{o}$C DECEMBER - MARCH

| Year | Mean Min.Monthly Temperature | Year | Mean Min.Monthly Temperature |
|---|---|---|---|
| 1940 | 8.58 | 1954 | 9.15 |
| 1941 | 9.3 | 1955 | 9.3 |
| 1942 | 9.8 | 1956 | 10.45 |
| 1943 | 9.4 | 1957 | 8.75 |
| 1944 | 9.3 | (1958-1964 - Not Recorded) | |
| 1945 | 9.8 | 1965 | 8.3 |
| 1946 | 9.4 | 1966 | 9.63 |
| 1947 | 9.95 | 1967 | 8.08 |
| 1948 | 8.93 | 1968 | 9.35 |
| 1949 | 9.58 | 1969 | 9.78 |
| 1950 | 8.55 | 1970 | 9.71 |
| 1951 | 10.35 | 1971 | 11.4 |
| 1952 | 8.45 | 1972 | 10.03 |
| 1953 | 9.38 | | |

N.B. Correlations with yield data for New Norfolk municipality were on a ground area basis and for Bushy Park region "hop hectares" data were available for sample farms in most years.

Since 1968-69 substantial proportions of state planted area lay beyond the Derwent Valley.

Source: Bureau of meteorology, Hobart.

4. STATE MEAN YIELD KG. PER HECTARE

| Year | Yield | Year | Yield |
|---|---|---|---|
| 1940 | 1,824 | 1959 | 2,657 |
| 1941 | 3,125 | 1960 | 2,189 |
| 1942 | 2,685 | 1961 | 2,251 |
| 1943 | 2,646 | 1962 | 2,257 |
| 1944 | 2,918 | 1963 | 2,212 |
| 1945 | 2,150 | 1964 | 1,212 |
| 1946 | 2,035 | 1965 | 1,588 |
| 1947 | 2,056 | 1966 | 2,310 |
| 1948 | 2,202 | 1967 | 1,598 |
| 1949 | 1,369 | 1968 | 2,241 |
| 1950 | 1,889 | 1969 | 2,603 |
| 1951 | 2,176 | 1970 | 2,228 |
| 1952 | 1,467 | 1971 | 2,032 |
| 1953 | 2,611 | 1972 | 2,150 |
| 1954 | 1,879 | 1973 | 2,354 |
| 1955 | 2,516 | 1974 | 2,772 |
| 1956 | 2,642 | 1975 | 2,174 |
| 1957 | 1,715 | 1976 | 2,200 |
| 1958 | 2,284 | 1977 | 2,266 |

Source: C.B.C.S. and A.B.S. annual industry statistics.

## APPENDIX II

### Further data available

Upon request to the author, the following data are available:

1. Farm area, hopground and other land use activities for all southern hop farms in: 1952; 1957; 1965; 1971; 1975; These data are not for publication, and have been grouped for obvious reasons.

2. Farm yield data for farms selling through H. Jones and Co., 1952 - 1966. These will be made available with appropriate grower permission.

3. Climatic data for Bushy Park, New Norfolk, Scottsdale, and some minor localities. These include mean monthly minimum and maximum temperatures, rainfall and limited sunshine hours.

4. State and municipal details on hop acreage, production and yield in most years since 1854.

5. Grower survey data including responses to certain behavioural questions. Names of growers will only be revealed with their permission.

6. Alpha acids yields for recent years - Scottsdale producers.

7. Australian hop production, imports, exports, hop extract imports and brewery consumption from 1950.

8. Miscellaneous details on hop prices, Farm Costs Indices and C.P.I. details for Hobart and Australia.

## APPENDIX III

(PLEASE PLACE ALL ANSWERS AS INDICATED)

1. Are you a hop producer in 1977-78

YES

(Tick whichever appropriate)

NO

2. Write here the years from 1945 in which you have produced hops (Please use crop years - crop harvested in 1965 is grown in 1964-65)

19 _____ to 19 _____

19 _____ to 19 _____

19 _____ to 19 _____

3. In which locality have you grown hops since 1945? (Please tick) (If more than one, please show dates also)

| | |
|---|---|
| Bushy Park | ..... |
| Glenora | ..... |
| Macquarie Pl. | ..... |
| Plenty | ..... |
| Ellendale | ..... |
| Westerway | ..... |
| National Park | ..... |
| New Norfolk | ..... |
| Lachlan | ..... |
| Molesworth | ..... |
| Huon | ..... |
| Kingborough | ..... |
| Scottsdale | ..... |
| Ringarooma | ..... |
| Lilydale | ..... |
| Other (Please | ..... |
| name locality) | ..... |

4. The following two pages ask for details on acreage, production and yield. Please complete only those parts of the table which you are able to complete with accuracy. If data are only approximate, please indicate thus: *

| CROP YEAR | ACREAGE IN HOPS | NO. OF HILLS | "HOP ACRES" | TOTAL PRODUCTION GREEN WEIGHT (LBS) | TOTAL PRODUCTION DRY WEIGHT (LBS) | STRINGING (NO. OF STRINGS PER HILL) | IRRIGATED ACRES FLOOD OR/SPRAY CHANNEL | NO. OF WORKERS EMPLOYED FULL TIME |
|---|---|---|---|---|---|---|---|---|
| 1944-45 | | | | | | | | |
| 1945-46 | | | | | | | | |
| 1946-47 | | | | | | | | |
| 1947-48 | | | | | | | | |
| 1948-49 | | | | | | | | |
| 1949-50 | | | | | | | | |
| 1950-51 | | | | | | | | |
| 1951-52 | | | | | | | | |
| 1952-53 | | | | | | | | |
| 1953-54 | | | | | | | | |
| 1954-55 | | | | | | | | |
| 1955-56 | | | | | | | | |
| 1956-57 | | | | | | | | |
| 1957-58 | | | | | | | | |
| 1958-59 | | | | | | | | |
| 1959-60 | | | | | | | | |
| 1960-61 | | | | | | | | |
| 1961-62 | | | | | | | | |

| CROP YEAR | ACREAGE IN HOPS | NO. OF HILLS | "HOP ACRES" | TOTAL PRODUCTION GREEN WEIGHT (LBS) | TOTAL PRODUCTION DRY WEIGHT (LBS) | STRINGING (NO.OF STRINGS PER HILL) | IRRIGATED ACRES FLOOD OR/SPRAY CHANNEL | NO. OF WORKERS EMPLOYED FULL TIME |
|---|---|---|---|---|---|---|---|---|
| 1962-63 | | | | | | | | |
| 1963-64 | | | | | | | | |
| 1964-65 | | | | | | | | |
| 1965-66 | | | | | | | | |
| 1966-67 | | | | | | | | |
| 1967-68 | | | | | | | | |
| 1968-69 | | | | | | | | |
| 1969-70 | | | | | | | | |
| 1970-71 | | | | | | | | |
| 1971-72 | | | | | | | | |
| 1972-73 | | | | | | | | |
| 1973-74 | | | | | | | | |
| 1974-75 | | | | | | | | |
| 1975-76 | | | | | | | | |
| 1976-77 | | | | | | | | |
| 1977-78 | | | | | | | | |

5. Please write below the crop years in which you found your own hop production to be financially rewarding.

_____ _____ _____ _____ _____ _____

_____ _____ _____ _____ _____ _____

6. In this section indicate years in which hop production merely returned costs or did not pay a satisfactory return.

_____ _____ _____ _____ _____ _____

_____ _____ _____ _____ _____ _____

_____ _____ _____ _____ _____ _____

7. In which years would you say that despite your best efforts the production of hops actually lost money?

_____ _____ _____ _____ _____ _____

_____ _____ _____ _____ _____ _____

8. In which years was your yield adversely affected by conditions over which you had little control? (Specify conditions)

| YEARS | CONDITIONS |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

Examples of such Conditions:- wind, drought, flood, hail, red spider, other disease etc.

9. What do you believe is the main reason why so many hop growers have left the industry?

.....

.....

.....

.....

.....

.....

10. Please tick below the capital equipment which you actually possessed as part of your hop-growing operation:-

| | TICK HERE |
|---|---|
| Mechanical Harvester (Please specifiy type _____) | _____ |
| Hop Drying Kiln and associated equipment | _____ |
| Overhead Spray Irrigation System | _____ |
| Flood Irrigation System | _____ |
| Mechanical Dressing Equipment (Please specify type _____ _____) | _____ |

11. How often did/do you consult with your neighbouring hop producers or other hop producers?

| | TICK HERE |
|---|---|
| About once a week | _____ |
| About once a fortnight | _____ |
| About once a month | _____ |
| About twice a year | _____ |
| About once a year | _____ |

12. Your most frequent source of information on hop production was/is:-

| | |
|---|---|
| The Department of Agriculture | _____ |
| The Hop Buying Agencies | _____ |
| Other (Specify) _____ | |

13. From 1945-1977-78, which years did you have other farming interests? (e.g. Small dairy herd)

| | YEARS |
|---|---|
| Specify here type of activity ..... | 19 ____ to 19 ____ |
| ..... | 19 ____ to 19 ____ |
| ..... | 19 ____ to 19 ____ |
| ..... | 19 ____ to 19 ____ |
| ..... | 19 ____ to 19 ____ |
| | 19 ____ to 19 ____ |

14. In which years would hops have formed your only productive activity/

19 _____ to 19 _____

19 _____ to 19 _____

19 _____ to 19 _____

19 _____ to 19 _____

19 _____ to 19 _____

15. What was/is the <u>total</u> size of your farm(s) in acres? _ _ _ _ _ _ ACRES

16. In your opinion, which part(s) of Tasmania produce the best hop crops?

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

17. Write here any other information or comments pertaining to the hop industry in Tasmania which you feel may be of value to a study such as this.

.....

.....

.....

.....

.....

.....

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